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edition of the Railroad Gazette is published each Friday at Queen Anne's Chambers, Westminster, London. It consists of most of the reading pages of the Railroad Gazette, together with additional British and foreign matter, and is issued under the name Railway Gazette.

CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information

EDITORIAL ANNOUNCEMENTS.

of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

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FRIDAY, SEPTEMBER 8, 1905.

The special committee of the Railway Signal Association which was appointed last May to take a letter ballot on certain points in semaphore design has sent out its circular, and, in addition to the subjects committed to it, asks the members, informally, to give their opinions for or against the use of the upward inclination of the semaphore blade to indicate all-right or "proceed." With a three-position signal this would necessitate the use of a combination something like Fig. 1.* If we may judge by the attitude in the past of the American Railway Association and other bodies of railroad officers, this proposition will be rejected by sheer force of conservatism. The downward inclination has been practically universal in America for many years, and it seems so much more natural that



Fig. 1.



Fig. 2.



Fig. 3.

operating officers and enginemen will be loath to vote against it. It is true that arms turned 45 degrees upward have been used for 10 or 15 years on the Atchison and the Erie, to indicate caution, but the advantage of the arrangement does not seem to be great enough to have found favor on other roads, even theoretically. Advocates of the simple downward inclination which is now so familiar in this country, must also recognize the fact that variations from it have been used a good deal in England, not to mention numerous other designs founded in Germany and France, most of which are looked upon by Americans as "freaks." Moreover, the "semaphore" as described in the 1864 edition of Webster's dictionary has five positions (Fig. 3), so that the American railroad semaphore can make no claim to correctness or pre-eminence by reason of purity of origin. The main reason for preferring the upward inclination is that no counterweight is needed to change the signal to the normal and

safe indication (stop) when a connection breaks or the arm is weighed down by sleet. But there ought to be a decided preponderance one way or the other in the iron casting, to provide for the return of a disconnected signal to the stop position at night, if the arm should break off, so it is not clear how much reduction it would be safe to make in the weight of the iron. With the arm in any position except vertical, the different designs probably have no advantage over each other in visibility, except what may be due to custom or habit or prejudice; but for the vertical position the arrangement shown in Fig. 1 would probably prove inferior to Mr. Grafton's well-known design. Whether or not the gentlemen of the committee, Messrs. Elliott, of the New York Central, Rudd, of the Pennsylvania, and Ames, of the Lake Shore, propose to recommend this change to their own managers, we are not informed (though it is understood that individually they favor it); but if they do intend to thus recommend they ought to have no difficulty in starting a very warm discussion in the next association meeting, for their respective managers control, collectively, probably 20,000 miles of road. The practice of that large mileage must powerfully influence the practice on many other roads.

Whatever may become of this proposition to change all at once 20 or 30 thousand semaphore signals, regardless of cost, the mere fact that the proposition is offered, with some show of formality, is a matter of interest to the railroad world, for it indicates a strong movement toward uniform methods and designs, and toward definite and intelligent discussion of signaling problems. These three men would not put forth this idea unless they were pretty well agreed upon it; nor unless they felt pretty sure of their ground with their respective fellow officers. There has been some criticism of American railroad officers for allowing the signal companies to do too much of their thinking, and of signal engineers for not doing enough thinking—for each other. Discussions looking to united action by the two largest railroad systems of the country serve to answer this criticism. In giving too free a hand to the manufacturers the railroads have by no means produced wholly unfavorable results, for it is chiefly to the manufacturers that we are indebted for many features of American signal practice which are superior to the practice of Europe. This softens the criticism just mentioned. But the only way to soften the criticism of the signal engineers is to again criticize the managements—for not giving the signal engineers enough authority and money. Not having any signal department at all, or having one and keeping it unreasonably subordinated, is the just charge against some companies. The chief drawback in

*See also page 223.

this beautiful prospect for united action is the danger, the same that is so familiar in the field of politics, of going too fast. A few strong men among the signal engineers may, indeed, decide on a scheme of signal practice in every way suitable for all the railroads of the country; but railroad operating officers, like functionaries in a city or national government, have notions of their own, and the ideas of other men concerning their duties cannot be at once transplanted into their minds except by perfectly organized authority; and even then the authority may need instruction. It is doubtful wisdom for a signal engineer to induce his general manager or chief engineer to adopt a practice of which the chief has not himself become a thoroughly intelligent and hearty advocate; and on even the best organized roads many branches of authority are, in this sense, still far from perfect, because the systems of roads have grown so rapidly. And when it comes to dealing with fifty or a hundred division superintendents, each of whom must, in the nature of things, be allowed more or less individual judgment and authority, the problem of uniformity may become very perplexing. A lot of these division superintendents ought to be brought into the Railway Signal Association, where they could more conveniently and profitably exchange ideas with the engineering department.

THE GROWTH OF TRAFFIC.

The report of the total traffic of the railroads of the United States for the fiscal year ending with June, 1904, makes it possible to measure the effect of the depression in business which may be said to have begun with that year. As we have often shown, in a rapidly growing country like this, an arrest of growth is equivalent in its effects on business and transportation to a positive decline in production in an older and more stationary community. We have had experience of a positive decline in this country, however, and a violent one, as after the fiscal year ending with June, 1893, which came after what may be called for this country a period of normal progress. This is shown by the following record of railroad freight transportation in successive years, in millions of ton-miles:

1890.....	76,207	1892.....	88,241	1894.....	80,335
1891.....	81,074	1893.....	93,588		

Here we have a growth of traffic amounting to 23 per cent. from 1890 to 1893, an average of 7 per cent. yearly, in a country whose increase in population was something less than 2 per cent. yearly. This is followed by the astonishing decrease of 13 per cent. in the single year from 1893 to 1894, the effect of which was nearly as great as a decrease of 20 per cent. would have been in a stationary community.

The recovery from this extreme depression was rapid, but substantially there was no resumption of the normal growth interrupted in 1893-94 until 1898, as the records of millions of ton-miles below show:

1894.....	80,335	1896.....	95,328	1898.....	114,078
1895.....	85,228	1897.....	95,139		

Thus there was about the same amount of traffic in 1897 as in 1893; then a sudden increase of 20 per cent. the next year, as if to make up for lost time.

This rapid growth continued, though at not quite such a rate, until 1903, the millions of ton-miles yearly having been:

1899.....	123,067	1901.....	147,077	1903.....	173,221
1900.....	141,599	1902.....	157,289		

This shows what is doubtless the great development of production and transportation on a large scale in economic history, the increase from 1897 to 1903 having been 82 per cent., and the mere increase in these six years being double the total freight traffic of France, Germany, and Austria combined.

The effect of the depression following 1902-03 is shown by the following comparison of the millions of ton-miles in that and the following year:

1904.	174,522	1903.	173,221	Increase.	1,301	Per cent.	0.6
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That is, the freight business in the bad year for trade was just about the same as in the previous year, which was the best of all years. That it was a bad year needs not at this day to be pointed out by referring to the statistics of iron production, etc. And this shows, what we have said before, but what is not sufficiently appreciated, that in a country like this an arrest of growth is an industrial disaster. When a country has had to provide for an average growth of 12 per cent. yearly for six years in production and transportation, a sudden reduction of this growth to less than 1 per cent., like that from 1903 to 1904, means that an important part of the machinery for production and transportation will find no employment for the time. If there had been no more of such machinery in 1904

than in 1903, there would have been equally full employment for it; but there was more, and in some branches of business a great deal more, and consequently much of it could not be worked to its full capacity. That the arrest in growth was much less serious than the large actual decline from 1893 to 1894 is, of course, true, and that the depression extended over a much shorter period, the present condition of industrial production and transportation has already demonstrated. Further evidence that the great mass of the population suffered comparatively little by the depression of 1903 is shown by the statistics of passenger transportation. This fell off 14 per cent. from 1893-94 to 1894-95, and it was not till 1899 that it equaled the travel of 1893. But in 1903-04 the travel was nearly 5 per cent. greater than in the previous year, the amount, in millions of passenger-miles, since it began to grow in 1899, having been:

1899.....	14,591	1901.....	17,354	1903.....	20,916
1900.....	16,039	1902.....	19,690	1904.....	21,923

The increase from 1899 to 1904 has thus been just about 50 per cent., or at an average rate of a little less than 9 per cent. yearly, the yearly increase in population meanwhile (swelled by exceptionally heavy immigration) being probably a little more than 2 per cent. In the earlier years of this period there was a rapid increase of trolley mileage and travel and a considerable one in every year, so that the increase of steam railroad travel does not indicate the whole. Now travel is a pretty good index to the condition of the mass of the population. A very large part of it is avoidable, and will be avoided when people find it hard to pay for food, clothes and rent. In the last year reported it was swelled somewhat, doubtless by the St. Louis World's Fair. The amount of growth in successive years has been, in millions of passenger-miles:

1899 to 1900...	1,448	1901 to 1902...	2,336	1903 to 1904...	1,007
1900 to 1901...	1,315	1902 to 1903...	1,226		

Considering the effect of the St. Louis Fair, which was almost wholly in the last year, the decrease in the amount of growth is considerable; but after all, the increase must have been as rapid as the increase in population, and the average man traveled as much in the last year as in any previous year.

The growth of traffic from 1897 to 1903 was certainly abnormally great. We must not expect again an increase of 82 per cent. in freight traffic in six years. It was only possible because of the sudden and great expansion of the mineral industries, especially iron manufacturing. At such a time of large profits and growing business, men are eager to increase the capacity of their productive plants, and they usually overdo it. If the increase exceeds the growth of the demand for several years, as has sometimes been the case, a prolonged period of depression results. It now appears that nearly all important industries are again pretty fully employed, and yet that there is not yet any great or general movement towards increasing the capacity of such industries. That means that there is not soon likely to be an overproduction, and that existing industries will remain busy. The railroads will have to provide for a growth in traffic, but not at the rate of 82 per cent. in six years, as from 1897 to 1903.

THE OVER-CAPITALIZATION OF STREET RAILWAYS.

The over-capitalization, taking the country through, of our street railways, is too familiar a general fact to need more than the most curt allusion. But the measure of that fact is a much more difficult proposition. We know that street railways are greatly over-capitalized, but we cannot say exactly how much in figures or in ratios. States vary and localities vary. If city railways could be grouped and compared with the "cross-country" lines, we should probably find variations in the hydrometer, and perhaps that the long-distance lines differ from both. The census figures for mileage-capital are crude, and the schedules prepared so long ago as to be already outlived. There are such intrinsic obscurities, also, as the fair recapitalization in shifting from the archaic horse car to the modern trolley. Even the test of "replacement value" shifts from year to year considerably with the cost of labor and material. And if, in the lack of absolute standards of mileage capitalization, we add the premeditated devices by which mist has been thrown on the street railway waters, the subject grows even more complex.

In seeking what we may call a water measure for the general street railroad capitalization in stock and bonds, there is, however, one rough standard unit accessible, and the State of Massachusetts supplies it. Practically alone, of the commonwealths of the Union, her State Railroad Commission has succeeded in keeping down capitalization to cost. But even to her standard of \$49,158 per track mile there are one or two qualifications. In the early stage

of her street railway building her commission did not succeed in applying strictly its later rule. Again, with her 34 cities, her immense suburban population, and her subway and elevated lines in Boston, the actual and honest mileage capitalization of her lines probably exceeds the normal. We are borrowing from her a sounding line marked somewhat too long, with the result of undermeasuring the depth of water when the fathoms are read. But, even with that allowance, the tests are of interest. If we omit for Massachusetts thousands, raise her 49 plus to 50—where it probably about stands at the present time—and, to make the comparison at once more easy and graphic, raise also this measuring unit to 100, we obtain, in approximate figures for mileage capital, the table annexed, derived from the returns for 1904 lately compiled by the *Street Railway Journal*.

Massachusetts	100	Southern States.....	223
Rest of New England	139	Western States	174
Eastern States	297	United States (Mass. excluded) ..	217
Central States	206		

The eastern States in the table include New York, New Jersey, Pennsylvania, Delaware, District of Columbia, Maryland, Virginia and West Virginia; the Central States, Michigan, Ohio, Indiana, Kentucky, Wisconsin, Illinois, Minnesota, Iowa and Missouri; the Southern States, the Carolinas, Georgia, Florida, Alabama, Mississippi, Tennessee, Louisiana and Arkansas; and the Western States, the Dakotas, Nebraska, Nevada, Kansas, Indian Territory, Oklahoma, Texas, Colorado, Montana, New Mexico, Idaho, Utah, Washington, Oregon, California and Arizona. It will be noticed that, by what we may characterize as the "Massachusetts standard," the Eastern States group stands capitalized in stocks and bonds at almost three to one—a return to be measurably looked for in a region containing New York City, Philadelphia, Baltimore, and several other cities rising into their hundreds of thousands of population. The Central States, with the cities of Chicago, St. Louis, Cleveland, Cincinnati and Detroit, are also at pretty high-water mark, with a ratio of more than two for one in capitalization. Much more surprising is the fact that the relatively thickly settled Southern group outstrips the great Middle West in mileage capitalization—perhaps to be accounted for by the fact that exploitation of street railways and the "bond and bonus" device struck the South after the system had been well learned at the North—and the same idea rings plausibly when the capitalization of the far West is contrasted with Massachusetts. The general average for the whole country, outside of Massachusetts, of more than two to one—217 to 100—and suggesting about 58.5 per cent. of street railway stock and bonds combined and now outstanding as dropsical, is probably not so very far from the real mark.

The causes of this imposing excess of capitalization are now becoming historical, but are not hard to find. They take us back to the later eighties, when the first trolley mechanism proved clumsy, noisy and unpopular, and was, on some lines, discarded; to the improving of them a few years later, when the trolleys leaped into popularity with a great bound, when speed, cleanliness, control and comparative noiselessness succeeded the odors, the stress and the dirt of the sluggish horsecar, and when the promoter and shrewd investor, far ahead of the public in their precision, carried through, in varied forms, their "bond and bonus" plans of recapitalization. We realize these things now with all the belated wisdom of hindsight. What we do not realize quite so well is that the great electric street railway "boom" of the nineties struck the country when legislation and the State Railroad Commissions were in a condition of Russian unpreparedness. In a good many states the commissions had no foreview of street railways at all; the body of legislation relating to them was scant and of the narrow "horse car" pattern, and totally unfitted for the new development; the universal cry for trolleys drowned in law-making bodies the subject of wise capitalization or carefully relegated it to the future, and the individual who wanted to see the electric line pass his door or tap his farm concerned himself little then with future rates of fare to pay dividends on watered stock. Everybody's business was, as often, nobody's business, and, in the *hiatus* the promoter, the speculator and the quick investor saw their chance and used it.

All this is rather trite, if impressive, history. But its result—if we accept the evidence of the Massachusetts standard—is that we have a system of street railways at once vast and vastly over-capitalized; and when we seek a remedy for the past, constructive criticism beats against the bars in vain. Something—indeed much—may be done in the future with the Massachusetts example as a precedent. But the stock waterings of the heretofore have already fallen into the old steam railroad category. They have been buried under successive strata of consolidations, are well-nigh untraceable,

have passed largely from the original profit takers to innocent holders, to trustees, to savings banks, to conservative investors who ask, as to corporations, not whether stock was originally paid in as cash, but what are present prongs, and whether those profits will continue. It would be interesting if we had the figures to show the millions of street railway bonds marketed originally below 75; it would be equally interesting to know the large proportion of those same bonds that have risen to a 3.90 investment basis and in some states been opened to savings banks; and it would be much more interesting to discover what reply a State legislature, trying to root out the old evil, would make to the innocent bondholder who urges that the state, an original, if silent, partner in the transaction, must father its own sin of omission. Practically no remedy, certainly no radical remedy, for the great over-capitalization of the average American street railway is therefore in sight. But, if the subject for that reason becomes a bit theoretical and academic, its history, its results and its magnitudes are not less suggestive and picturesque.

Railroad Earnings in July.

The large increases in gross earnings for July over those reported for the corresponding period last year are due for the most part to the generally prosperous condition of industrials, which bring in their train all kinds of traffic. The iron and steel industry accounts for much of it, the large plants all running to their full capacity. The figures are especially large because of the great falling off in traffic a year ago when the majority of roads showed decreases as compared with 1903. The Atchison illustrates this with its increase of \$942,077 over last year, when it reported a decrease of \$643,757. On this road, the increase of July, 1905, over July, 1903, is \$298,320, which gives a fairer idea of conditions. The increase on seven roads of the Southwestern group is \$1,877,805, or 13 per cent., due apparently to increased shipment of live stock. Last year the beef strike was responsible for the great falling off in this traffic. In the middle and middle western group, the increase of 15 roads is \$4,630,809; 9 per cent. This is due to the generally favorable conditions already spoken of, and in particular to the fact that the coal strike last year made a big decrease in the earnings of coal roads, the Reading, for example, showing a decrease of \$1,157,642 at that time. The only roads in this group showing a substantial decrease this year are the Wabash and Illinois Central, and this is explainable by the increased passenger traffic occasioned last year by the World's Fair at St. Louis. Eight roads in the Northwestern and Northern Pacific group report an increase of \$1,188,226; 5 per cent. Increases on these roads for August will be larger, as they will show the effect of the grain movement, which is, of course, much greater than last year. In the Southern group, the total increase of four roads is \$792,940; 9 per cent. The cotton crop this year is large and there was also much of last year's crop to be moved during July, while the crop of 1903 was so small that there was but little of it left to be carried in July, 1904.

The accompanying table shows the gross earnings for July, 1905, and July, 1904, of 34 roads:

	July, '05.	July, '04.	Increase.
Atch., Top. & Santa Fe.....	\$5,684,913	\$4,742,836	\$942,077
Baltimore & Ohio	5,768,830	5,274,542	494,288
Buffalo, Rochester & Pittsburg.....	766,487	649,195	117,292
Canadian Pacific	4,548,000	4,316,000	232,000
Central of Georgia	877,960	745,651	132,309
Central of New Jersey	2,071,756	1,921,655	150,101
Chesapeake & Ohio	1,775,614	1,671,503	104,111
Chicago & Alton	930,637	947,149	*16,503
Chicago Great Western	618,492	524,423	94,069
Chicago, Milwaukee & St. Paul.....	3,955,688	4,002,220	*46,532
Cleve., Cin. & St. Louis.....	1,890,912	1,764,084	126,828
Colorado & Southern	554,583	483,380	71,203
Chicago, Rock Island & Pacific.....	3,871,386	3,033,999	837,387
Denver & Rio Grande	1,469,400	1,287,900	181,500
Illinois Central	3,748,999	3,805,184	*56,185
Lehigh Valley	2,648,259	2,556,546	91,713
Louisville & Nashville	3,298,210	2,921,238	376,972
Missouri, Kansas & Texas	1,626,731	1,388,397	238,334
Missouri Pacific—Iron Mountain.....	3,360,000	3,223,000	137,000
Minn., St. Paul & Sault Ste. Marie.....	746,547	597,747	148,800
†Montana Central	200,832	180,736	20,095
†New York Central & Hudson River.....	7,135,299	6,443,619	691,680
New York, Ontario & Western	708,523	646,806	61,717
Norfolk & Western	2,127,747	1,805,724	322,023
Northern Pacific	4,471,792	4,071,388	400,404
Pennsylvania Railroad	10,831,703	9,481,103	1,350,600
Philadelphia & Reading	3,098,279	2,661,438	436,841
St. Louis & San Francisco	3,156,844	2,783,504	373,340
Southern	4,022,954	3,716,117	306,837
St. Louis Southwestern	670,181	641,981	28,200
†St. Paul, M. & M.	3,694,329	3,491,979	202,350
Texas & Pacific	802,391	759,240	43,151
Wabash	2,001,080	2,082,164	*81,084
Y. & M. V.	497,666	520,844	*23,178

*Decrease.

†And leased lines.

‡Great Northern.

Leather upholstery for the seats of the smoking and chair cars of the new "Alton Limited" trains described last week is a feature meriting special notice and commendation. The heavily carved woodwork, mouldings and other "gingerbread" work that was once

considered the most artistic finish for interiors of passenger cars, but which was principally effective to catch and hold dirt, has given way to the present smooth finish and use of highly polished woods, combining simplicity and quiet elegance. But aside from and more important than the esthetic considerations, is the sanitary advantage of the present practice. Yet American railroads still retain one relic of former practice which is more unsanitary than all the rest; the dust-retaining germ-holding plush covering of the seats. As long ago as 1893 the New York Board of Health issued an order requiring that upholstered seats in public places be covered with leather or some substitute having similar characteristics to prevent the retention and spread of disease germs. It was also suggested that similar precautions be taken with regard to seats for railroad and street cars, steamships, etc. The importance of frequent and thorough cleaning of the plush covered seats is by this time probably fully appreciated by all of the roads, though the methods used at a majority of the terminals are far from effective; in fact, there is but one really effective method and that is the vacuum process, which is also the most costly. A leather covering, of course, needs no such treatment. That passengers would find the change to leather agreeable there is little doubt, especially in the hot and dusty summer months. On the score of first cost there can be no objection since there is little if any difference between the leather and the plush. The wearing qualities of leather in this service in comparison with the plush are not yet definitely known, but it is thought that its life probably would not be so long, especially since the plush can be dyed and used again when faded and dirty. But the sanitary advantage should be the paramount consideration, and it is to be hoped that the practice inaugurated by the Alton will soon become general.

Cleveland, Cincinnati, Chicago & St. Louis.

The company has changed the date of its fiscal year from June 30 to December 31 to make it uniform with the other Vanderbilt properties, and as the last report was published as of June 30, 1904, the present very brief document covers six months only, for the period ending Dec. 31, 1904. For this period gross earnings were \$12,141,288, operating expenses were \$8,358,207, and net earnings \$3,783,081. After deducting interest, rentals and taxes aggregating \$1,847,370, a balance remained of \$1,935,711. Two quarterly dividends of 1½ per cent. each were paid on the preferred stock and one dividend of 2 per cent. on the common stock, requiring a total of \$809,768. As a reserve fund for equipment renewals one million dollars was then set aside and a surplus of \$94,951 was carried forward from the six months' operation. Ton miles increased 5.6 per cent. as compared with the corresponding six months of the preceding year. Freight revenue decreased six-tenths of one per cent., average ton-mile receipts decreasing from 6.77 mills to 6.38 mills. The average revenue train load increased from 336 to 342 tons, but freight train earnings were \$2.21 a mile as against \$2.31 in the last half of 1903. Passenger traffic shows tremendous increases, presumably due chiefly to the St. Louis Fair. Passenger miles increased 45½ per cent. and passenger revenue 31½ per cent., the average rate per passenger mile having decreased somewhat. Passenger train mileage increased 610,201 miles. Passenger earnings for the six months at hand constituted over 36 per cent. of the total earnings, while during the same six months in 1903 they amounted to about 31 per cent.

In spite of the heavy passenger train movement on account of the Fair the charge to conducting transportation showed a decrease over the corresponding six months in 1903. The specific item which is responsible for this decrease is the per diem balance, which was less than half as high in the 1904 period as in the 1903 period. The cost of fuel also decreased somewhat. Total operating expenses increased \$174,090, to the figure given above; the increase coming chiefly under the head of maintenance of way and structures, and particularly in the items of tie, bridge and culvert renewal.

The freight ton mileage increased 43,328,062 ton miles, although the lower average rate occasioned a decrease in earnings. Part of the reason for this lower average rate is doubtless attributable to the large increase in tonnage of bituminous coal hauled. This commodity now amounts to about 28 per cent. of the total freight tonnage moved.

Principal operating statistics are as follows:

	1904.	—Last half of— 1903.
Average mileage worked	1,891	1,891
Freight earnings	\$6,810,028	\$6,848,385
Passenger earnings	4,480,037	3,405,778
Gross earnings	12,141,288	11,070,132
Maint. way and structure	1,452,871	1,274,587
Maint. of equipment	1,538,168	1,492,687
Conducting transportation	4,966,499	5,028,937
Total, operating expenses	8,189,895	8,015,804
Betterment charges additional	168,313	129,807
Net earnings	3,783,081	2,924,521
Interest taxes and rentals	1,847,370	1,855,686
Balance to credit of income	1,935,711	1,068,835

TRADE CATALOGUES.

Idea: Power for August has as leading articles, "Economy of Surfacing Stone by the Aid of Compressed Air," "Steel Work in the New York 69th Regiment Armory," "Sinking Concrete-Filled Steel Piles Through Quicksands by the Aid of Compressed Air," "Scaling Condenser Pipes by the Aid of Pneumatic Hammers," and "Venting Cores," an interesting paper by Jas. A. Murphy read at the June meeting of the American Foundrymen's Association.

Superheated Steam.—The Power Specialty Co., New York, sends a pamphlet bearing the above title. It contains a full detailed description and illustrations of the Foster patent superheater which is made by this company. Copies of comparative tests on the use of saturated and superheated steam at the Spring Creek pumping station, Brooklyn, and the Central Park avenue pumping station, Chicago, are also given.

Traveling Hoists and Trolleys.—The Niles-Bement-Pond Co., New York, sends a handsomely illustrated catalogue, 9 in. x 12 in., of its electric traveling cranes and hoist. These run on a single I-beam and are especially useful for handling loads up to five tons. Brief descriptions and detailed illustrations of the various types are given, and full page illustrations show the devices in actual use.

Coal Handling Machinery.—The Sullivan Machinery Company, Chicago, sends an interesting catalogue descriptive of its automatic cross-over dump. This device is used for the rapid and economical handling and loading into railroad cars of coal, ore, rock, etc., from mines and quarries. The pamphlet is clearly written and is illustrated throughout.

Balanced Compound Locomotives.—The Baldwin Locomotive Works, Philadelphia, Pa., sends its "Record of Construction No. 53." It is handsomely gotten up and is illustrated throughout and contains valuable data and notes on the principles and performances of the balanced compound locomotive.

Concrete Mixing and Measuring Machine.—The Link-Belt Engineering Co., Philadelphia, Pa., sends an illustrated pamphlet descriptive of the Trump concrete mixing and measuring machine. The advantages derived from the use of this machine are clearly set forth.

Expansion Bolts.—The Steward & Romaine Mfg. Co., Philadelphia, Pa., sends an illustrated catalogue of its expansion bolts, toggle bolts, anchor bolts, pipe hooks and hangers, brass cap nuts, etc.

CONTRIBUTIONS

Street Car Ticket Lotteries in Mexico.

City of Mexico, Aug. 24, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Your issue of August 18 contained mention of the ticket lottery scheme now in use on the street railways of Mexico City. That it has met with success is indicated by the published announcement of the company, that at the end of the first month it was in practice, the net receipts from fares had increased 29 per cent. A few days ago it was discovered that conductors had printed counterfeit tickets, receipts, to give passengers, but that was soon stopped, and nine of the conductors are now in the penitentiary. The entire public agrees that the system will prove a perfect success; and the company, from the start, removed all its patent indicators and four-fifths of its inspectors or "spotters."

J. MAC D. DE MUTH,
Editor of *The Mexican Railway Journal*.

Divisional vs. Departmental.

New York, Aug. 25, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of Aug. 25 I notice a communication on the subject of "Railroad Organization" and your foot note inviting comments. I have some rather strong views on this subject of organization, which I shall take the liberty of briefly outlining to you as follows:

From an intimate connection with the departmental organization and a close study of the divisional organization on other railroads I have formed the conclusion that the divisional organization gives far better results, provided the superintendents in charge of the divisions are men who have had a detail training in maintenance of way and motive power as well as in the transportation service. In my opinion the secret of the success of the divisional system on the Pennsylvania Railroad is due to the system that was adopted many years ago by that company for the training

of their future officers in the technical departments. When the divisional organization is attempted with men whose experience has been confined to transportation problems I have noted that their lack of experience in mechanical and maintenance of way problems seriously detracts from their usefulness and is apt to result in a deterioration of track and equipment. On the other hand, if the experience of the superintendents has been confined to transportation matters I believe that the departmental organization is the better, as the motive power and maintenance of way departments are then controlled by men who have had special training in those directions. To summarize, in my opinion the best organization is effected by having superintendents who have had more or less detail training in maintenance of way and motive power problems and experience in transportation matters, with territory not too large to prevent their personal supervision of the work under their charge and coupled with an opportunity to keep in touch with industrial conditions along their line.

VICE-PRESIDENT.

Tests of Locomotive Valve Gears.

New York, Sept. 2, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

In your issue of September 1, page 200, is a short account of the performance of a locomotive on the Pittsburg & Lake Erie equipped with the Allfree-Hubbell valve gear. The results show an apparent saving of about 5 per cent. in coal in favor of the locomotive fitted with this improved gear, when figured on the basis of coal consumption per 100 ton miles. However meritorious this valve gear may be, it nevertheless appears that the basis on which the coal consumption is calculated is by no means a safe one upon which to draw conclusions. While for statistical purposes the ton mile is well adapted as a basis upon which to make comparisons, it must be used with great caution in making accurate analyses of the value of any device which may be applied to the locomotive.

It is well known by those familiar with locomotive performance that two locomotives similar in design and workmanship and used in the same kind of service over the same division, may give results as to coal consumption widely at variance. Such differences in economy may be due to differences in the individual ability of the firemen, to differences in the climatic conditions, to leaky flues, to heavy side winds and to a variety of causes not easily determined or accounted for. The true measure of the work done by a locomotive is the drawbar pull which can only be accurately determined by the use of a dynamometer car or by placing the locomotive on a testing plant.

From these considerations, it has always seemed to the writer to be unsafe to judge the merits of a device such as a valve gear by the results of purely service tests. At best, an improved valve gear can only show economies within rather narrow limits, these limits, in most cases, being within the variations due to the skill of the firemen, etc. It is not my intention to enter into a discussion of the value of the Allfree-Hubbell gear, but in the interests of the promoters of this and other devices and of the railroads, it would be well to make thorough scientific tests in such a manner that all influencing elements can be measured and properly credited.

CHARLES DUCAS, M. E.

Competitive Signal Installations.

New York, Sept. 4, 1905.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Occupying now an independent position in regard to railroad and railroad signal companies, I feel that I may make a suggestion to you which I think will, if it meets with a successful issue, eliminate the possibility of doubt as to the fair distribution of contracts awarded upon a competitive basis.

My suggestion is that you use your columns for the purpose of urging upon railroad managers, in the interests of all competitors, the justice of—

First.—The preparation of carefully thought out and complete plans and specifications of the proposed works.

Second.—Date fixed for the opening of bids, of which all competitors shall be notified and invited to attend the function, to witness the opening of the bids.

HENRY JOHNSON.

[Mr. Johnson's suggestion of the method to be pursued by a railroad company with a capable signaling department is not criticizable, but the managers of such companies need no urging from us. They are few in number and are already doing something like what is suggested. As to the others, the nine-hundred and ninety and nine, there seems to be but two rational courses: Employ an expert to study the conditions and prepare plans. Mr. Johnson, Mr. Sperry and others are competent. The other decent way is to pick out the signaling company, employ it and trust it. This can only be done with safety when there is absolute frankness on both sides. Shop costs, loading and profit and every item of information

needed are in such cases the rightful property of the railroad company. This method is usual in England, where there is very little dishonesty in such matters, and it is not uncommon here.—EDITOR.]

Salaries on the Russian State Railroads.

From a table printed in the current Bulletin of the International Railway Congress, we have taken the following statement of the salaries paid Russian railroad officers in the year 1901. The system is divided into 22 parts. The highest administrative authority on each of these operating lines is the general manager. The highest salary paid a general manager is on the Southwestern system, where he receives \$8,000 a year. The least salary paid a general manager is \$2,700, on the Baskutchak system. The other general managers receive either \$6,000 or \$7,500 each. The salaries of the heads of the permanent way, rolling stock, locomotive, traffic, telegraph and stores departments range in the vicinity of \$3,200. These officers, together with the general managers, are classified as administrative authorities. The next class, designated as executive authorities, includes the heads of sections of the permanent way, locomotive, traffic, telegraph and goods departments, and the station masters. The highest pay in this class goes to the heads of sections of the traffic department, who average from \$1,200 to \$1,900 per year. Heads of the permanent way department receive about \$1,400; heads of the locomotive department about \$1,000; heads of the telegraph department about \$600, and heads of the goods department as a rule slightly less, although on some roads the goods department section head is paid more than the section head of the telegraph department. Station masters receive about \$400, on the average, and in some cases considerably less. The accounting officers constitute the third general classification, and receive pay generally lower than the station masters. On a characteristic system, the Baltic & Pskov-Riga, there are 33 men classified in what is known as the Central Accountancy, and these receive about \$432 each, annually.

Railroad Cases Decided in August.

The following abstracts cover cases decided by the United States Supreme and Federal Courts during the month of August:

Stopping trains at county seats.—Mississippi has a unique statute which authorizes the Railroad Commission of that state to require all passenger trains to stop at county seats. The Federal Circuit Court was recently called on to construe this act in a case where the Commission issued such an order against the limited trains of the Illinois Central Railroad. The court took the view that since the company furnished the particular county capital in question with three passenger trains each way per day that its legitimate wants were fully supplied and that a demand that through trains should likewise stop, when these trains were mainly for the transportation of interstate through business on a fast schedule to comply with a mail contract with the government, was unreasonable. *Illinois Central R. R. Co. vs. Mississippi Railroad Commission*, 138 Fed. Rep. 327.

Care in place of work for employees.—The care of a railroad company as to the safety of the place for work of its employees is defined as the ordinary care displayed by prudent intelligent men under like circumstances. A brakeman or other employee will be held to assume the risks of danger from conditions long maintained by the company and which are similar in character to those of other railroads in the vicinity, as for instance open culverts at points remote from stations. *Southern Pacific Co. vs. Gloyd*, 138 Fed. Rep. 388.

Alien beneficiaries in suits for death.—It is no defense to an action for wrongful death in New Jersey that the beneficiaries of the fund recovered are non-resident aliens. *Hirschkovitz vs. Pennsylvania R. R. Co.*, 138 Fed. Rep. 438.

Wilful negligence at crossings.—South Carolina has a statute under which the failure to give the statutory signals at a railroad crossing creates a *prima facie* case of negligence against a railroad company if the omission in any manner contributed to the injury of a person on the crossing, unless the injured person was guilty of "gross or wilful negligence" himself. The statute was recently invoked in the Federal Court in that state and it was there decided that a traveler knowing of the existence of a railroad crossing who approached the crossing at night with the side curtains of his carriage drawn and drove on the crossing without listening or casting a glance in the direction of the track displayed such "gross and wilful negligence" as would prevent the recovery of any damages for his injuries. *Southern Railway Co. vs. Carroll*, 138 Fed. Rep. 638.

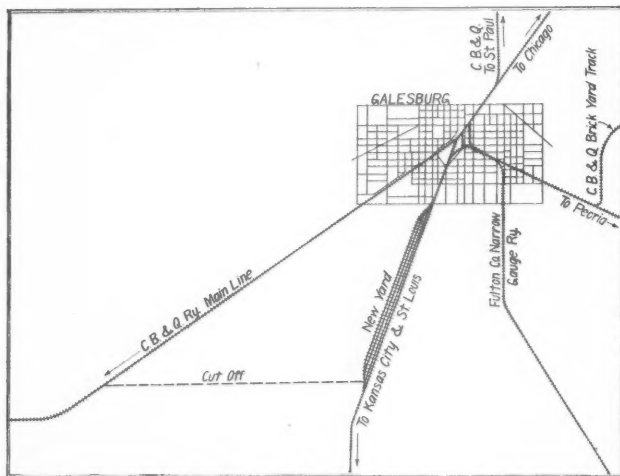
The Southeastern Freight Association.—Judge Speer, of the Federal Court for Georgia, speaking of the Southeastern Freight Association in an opinion reviewing the action of the Interstate Commerce Commission in regard to lumber rates in that jurisdiction, says: "In that territory, with all of its varied products, with an

area and population vaster than many empires of which we have an account, as regards every interest dependent upon the transportation of commodities, the action of the association is more authoritative than the firman of the Sultan or the ukase of the Czar." In this opinion the position is taken that the national courts should not discredit the conclusions of the Commission, as the Interstate Commerce Act itself creates a rule of presumption in favor of the reports of the Commission. In his view the Commission was intended to be an expert tribunal empowered by law to determine in the first instance the reasonable or unreasonable character of the rates for interstate commerce. Coming to the particular offense of the freight association, the case of an unreasonable increase is stated most strongly. To quote his own words: "Where a vast increase of lumber traffic had resulted in a large increase of net revenue to the carrier, the service was inexpensive; required neither rapidity of movement nor specially equipped cars, shippers were obliged to furnish and pay for equipment, railroads were neither to load nor unload, the commodity was neither fragile nor perishable, the industry affords a tonnage second in magnitude to no other transported by the carrier, an arbitrary increase to points of principal destination of two cents a hundred is unreasonable and unlawful. This is especially clear where the particular traffic is practically destroyed immediately after the advance is made." In regard to the association Judge Speer holds that it is none the less an unlawful combination by reason of a stipulation in its articles allowing any of the members to withdraw from the agreement at any time. *Tift vs. Southern Railway Co.*, 138 Fed. Rep. 753.

Commerce Commission and private contracts.—The Interstate Commerce Act cannot be invoked to aid the enforcement of contracts between carriers and shippers. This rule is applied to a case where a shipper sought to charge a discrimination on the ground that the railroad company failed to furnish the number of cars called for under an express contract. It was held that the Interstate Commerce Commission was without jurisdiction. *United States vs. Norfolk & Western Railway Co.*, 138 Fed. Rep. 849.

New Freight Yard of the Burlington at Galesburg.

Galesburg, Ill., is the most important point on the Burlington Lines East of the Missouri River for the interchange of freight between the different lines of the system. With the exception of the Chicago-Minneapolis line, through traffic for all of the lines traversing the State of Illinois must pass through this point. The map herewith shows the situation at Galesburg. The Chicago-Omaha and St. Louis-St. Paul lines cross there. The Kansas City line branches from the latter at Bushnell, 37 miles south of Galesburg, and the line to Centralia (the Jacksonville & St. Louis) runs

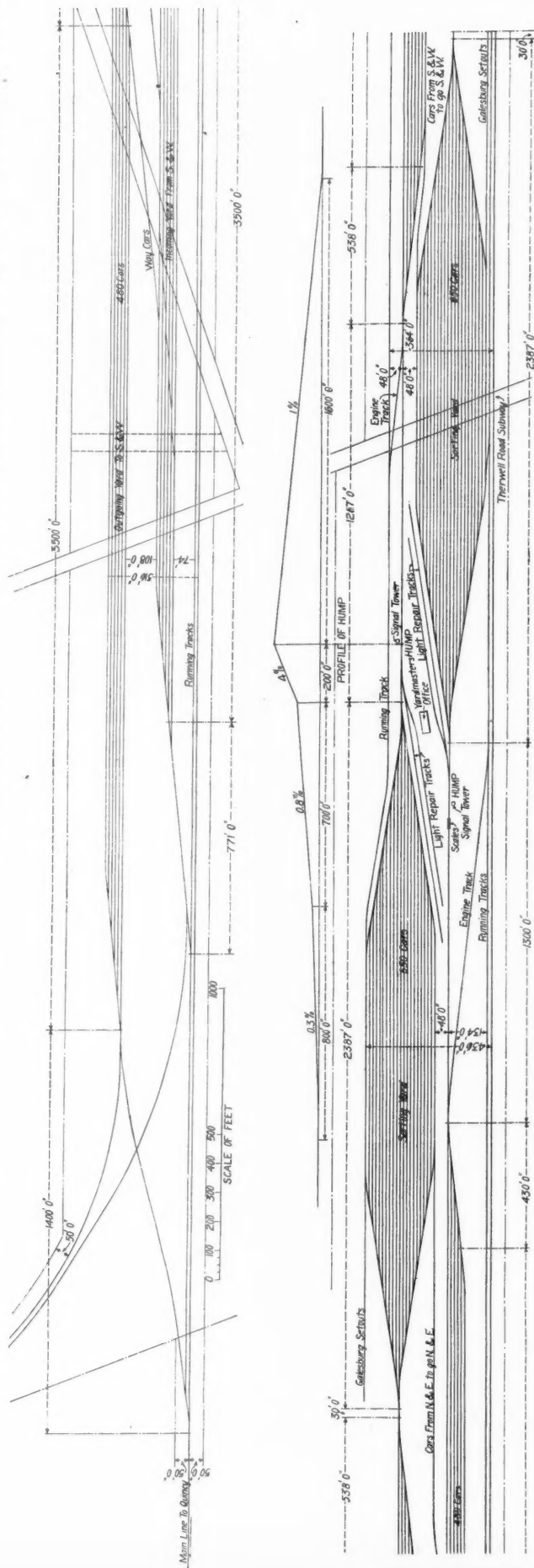


Galesburg, Ill., Showing Burlington Lines and New Yard.

southeast from Concord, 95 miles south of Galesburg. The Peoria branch runs southeast from Galesburg. The Centralia line, which already contributes an important coal traffic, is being extended 50 miles to Herrin, which will largely increase this traffic. Also the grades on this and the St. Louis-St. Paul line are being reduced to a minimum of $\frac{3}{10}$ of one per cent. northbound.

The facilities at Galesburg for some time have been inadequate properly to care for the heavy interchange of traffic at that point. The maximum length of yard track is 2,000 ft., which is too short for the 80-car and longer trains now common. The total amount of track room also is far too limited. The situation necessitated the building of an entire new yard and plans were prepared accordingly for a site immediately south of the present yard, adjacent to the line to St. Louis and Kansas City. Work has begun and is being pushed as rapidly as conditions will permit.

The general plan of the yard is shown herewith. It is a double

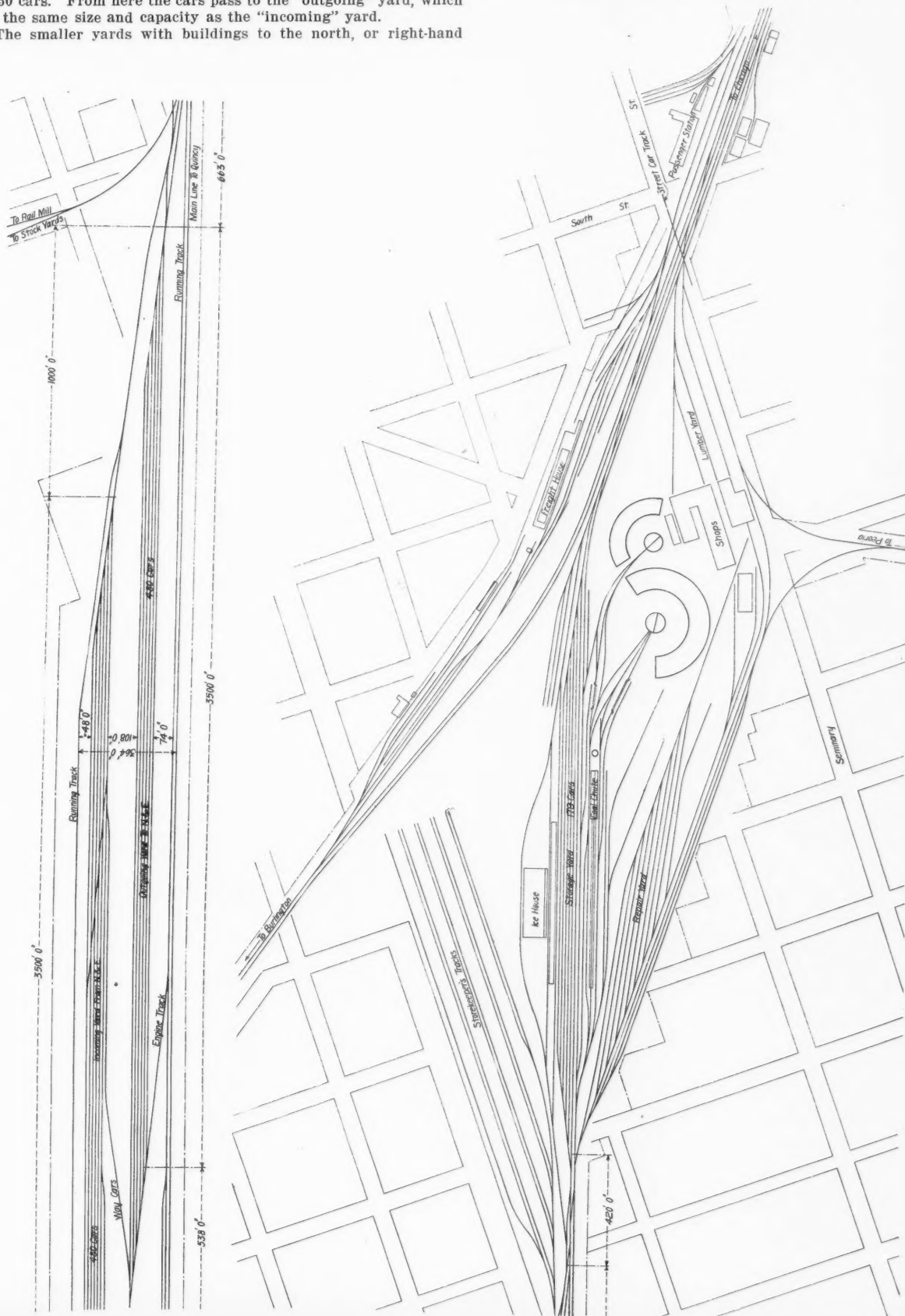


Entrance to, and Part of, the Burlington's New Freight Yard at Galesburg, Illinois.

hump yard almost three miles long and consists of duplicate halves, planned for movements in opposite directions; that is, one half is for the movements north and east and the other for the movements south and west. Each half is made up of an "incoming" yard having six tracks with capacity for 80 cars each, or 480 cars total. The outlet passes over a hump with a maximum approach grade of 4 per cent., from which the cars are directed down a 1 per cent. grade into the sorting yard, having 21 tracks and capacity for 650 cars. From here the cars pass to the "outgoing" yard, which is of the same size and capacity as the "incoming" yard.

The smaller yards with buildings to the north, or right-hand

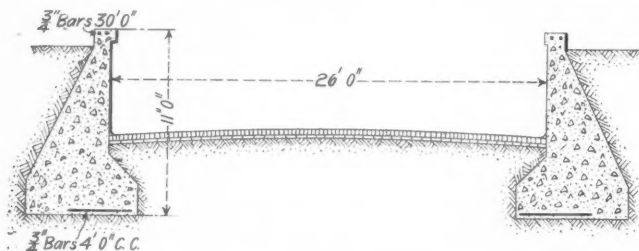
end, of the new yard occupy the site of the present yard, which is to be remodeled as shown. There will be a storage yard for 179 cars, a repair yard, and an icing plant of 15,000 tons capacity for refrigerator cars. As shown by the map, a cut-off will be built from the Omaha line to the south end of the new yard, the convenience of which is obvious. It will be about four miles long. All movements will be in the direction of traffic except between



New Freight Yard of the Burlington at Galesburg, Illinois.

the Peoria line and the lines north and east where a reverse movement must occur. Trains from the Peoria line are, of course, received in the north-and-east "incoming" yard. Cars destined north or east are switched across to the north-and-east sorting yard and thence to the "outgoing" yard. Cars from the north and east for the Peoria line follow the same yard movement.

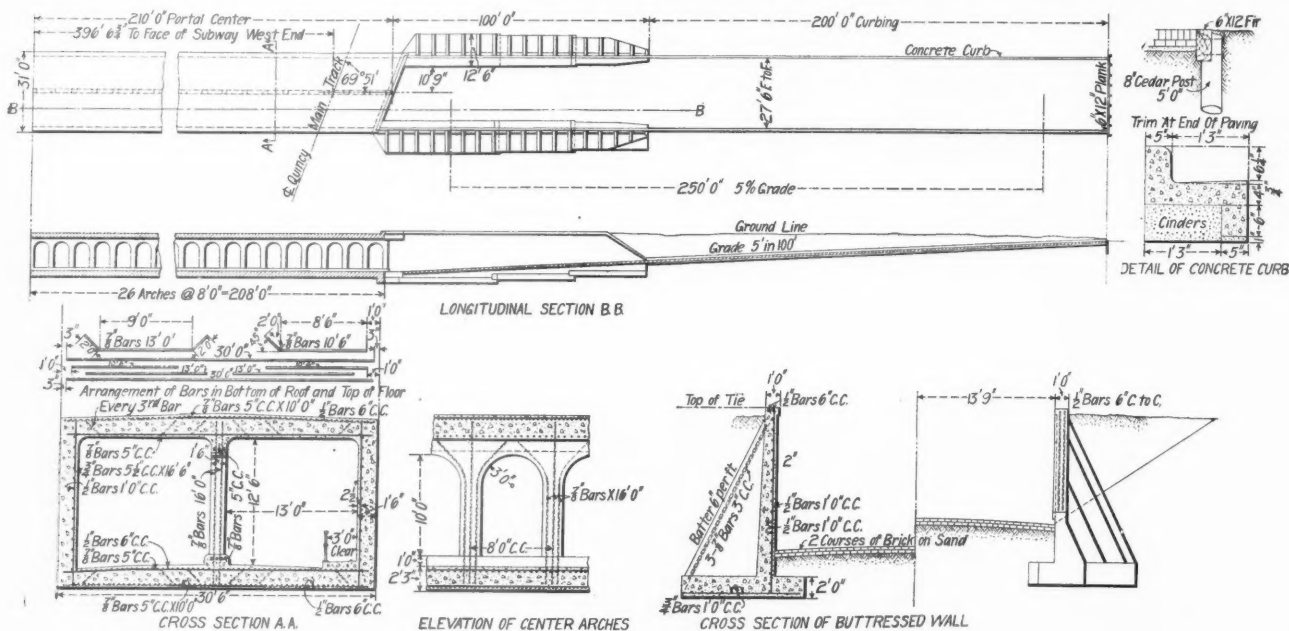
The yard will not be completed until next summer, although it is expected to have it half done before the bad weather of the fall stops the work, and the completed portion will be put into service at once. Operation will be from central towers adjacent to the humps, and when the yard is done it will be equipped for electric operation. Until that time the switches will be moved by



Cross-Section of Approach—Lemon's Corners Subway.

hand. The yard will contain about 30 miles of track and 200,000 cu. yds. of grading will need to be done. The total cost will be in excess of \$400,000. One considerable item in the cost bill will be two reinforced concrete subways passing transversely under the yards at the points indicated on the plan. They will be built in response to and in conformity with the demands of the community, which insisted that underneath crossings be provided at the intersections of the yards and two existing highways. The total length of each subway, including approaches, will be 1,000 ft., of which 420 ft. is subway proper. Drawings of the design are shown herewith.

The cross-section shows the details quite fully. It is a double-



Plan, Longitudinal Section and Details of Thirwell Road Subway.

roadway box design, 30 ft. 6 in. wide outside, 17 ft. high at the middle and 6 in. less than this at the sides. The inside clearance is 12 ft. 6 in. The partition wall between roadways is broken into arches 6 ft. wide, the distance c. to c. of columns being 8 ft. Johnson corrugated steel bars are used for reinforcing, $\frac{1}{2}$ in., $\frac{3}{4}$ in. and $\frac{1}{2}$ in. bars being used. Their arrangement is shown by the drawings. The clear width from side wall to partition is 13 ft. One side, however, contains a 3-ft. 6-in. sidewalk which reduces the clear roadway width. The sidewalk is protected by a gas-pipe railing 3 ft. high. The roadway will not be paved, and vehicles will run right on the concrete. The roadway is level at the center line and crowned 6 in. at the ends.

A buttressed design of retaining wall will be used for all of the approaches for the Thirwell Road subway, and possibly throughout in the Lemon's Corners subway, although drawings for the partial use of a solid design have been prepared. A cross-section of the roadway and this solid wall design is shown. The west ap-

proach to the Lemon's Corners subway is more elaborate than the others, as it extends both north and south parallel to the tracks. The total distance in each direction is 248 ft., or 496 ft. total. The estimated amount of concrete for both subways is something more than 8,000 yds.

The yard plan was prepared by Mr. J. D. Mason, formerly Chief Engineer of the Eastern Division of the Great Northern, and now engaged on special work for the Hill Lines. The subways were designed by the bridge department, Mr. C. H. Cartlidge, Bridge Engineer. All of the work is being done under the supervision of Mr. W. L. Breckenridge, Engineer of the Lines East of the Missouri River.

The Cost of Locomotive Operation.

XI.

BY GEORGE R. HENDERSON.

(Continued from page 183.)

MAINTENANCE.

General Repairs.—Probably no portion of our study is of greater interest than the question of repairs, yet it is one that defies every attempt to bring it to a scientific basis of comparison. We know in a general way that large engines are more costly to maintain than small ones, such as were used 20 years ago; that certain special types or designs are more troublesome to keep up than others; that labor and material are higher priced in the west than in the east; that certain sections of the country, on account of water, fuel, or physical conditions cause more frequent repairs; and that heavy trains (overloading) cause breakdowns and damage to the locomotives, but when we attempt to analyze these factors in detail and determine how much effect each has upon the general question of repairs, we find ourselves hopelessly stranded.

If we attempt to analyze statements and statistics regarding the cost of repairs, and wish to unravel the why and wherefore of each statement, we enter a labyrinth of detail and investigation that will be as unproductive as it is laborious. The enormous

number of factors entering into this proposition is such that many of them cannot be assigned positive values, by which any close attempt to estimate beforehand the probable cost of repairs for any given locomotive in any specified locality will be fruitless. It often happens that two or more locomotives, exactly alike, are put on the same runs, and in the first year one of them will cost two or three times as much as the others. This is frequently laid to the carelessness of the men handling the unfortunate engine—it often happens that the blame should be divided between the engineers and the builders of the machine, who, perhaps, have slighted some of the workmanship, or supplied defective material. Some engines continually break frames or cylinders, while others, apparently identical in every way, give no trouble. Of course, there is a reason for all these things, and it is allowed that many of them should not be permitted to exist, but they *do exist*, and the best that we can do is to recognize them, and correct them as fast as possible.

However, as in the case of losses in fuel, all engines have some

troubles, but some usually do not have all, so that for a large division the matter is likely to equalize itself, and the average may remain fairly constant. Thus for the year 1899, the cost of repairs and supplies per engine mile on the Chicago & North-Western ran between 3 and 4 cents each month during the year, but did not touch either of those figures. Some roads think that a regular appropriation will suffice to cover the cost of repairs, but as wrecks and unforeseen contingencies are likely to arise, distorting the average for the particular month, it is not recommended. Our caption, general repairs, must not be taken in the strict sense in which it is ordinarily used by railroad shops, but for our purpose must include everything which cannot be properly considered running repairs. It is customary on some roads to consider all general repairs when the cost at any one time reaches a certain figure—sometimes \$750. While this may be of some benefit in classifying the amount of work done, it is of little actual value, unless all the conditions are known, and also the mileage since the previous general repairs.

Some railroads regulate their shopping by the mileage which the engine has made since the last shopping. In this system the mileage made is posted each month on a card, and the additions of the previous month are made, and when the shopping mileage is reached, the engine is withdrawn from service. We believe the better way is to have the condition examined and reported each month, as the actual condition is at all times more important information than the bare mileage. For example, we would expect ordinarily that passenger locomotives should make 120,000 miles and freight engines 80,000 miles between general repairs, but even this is ambiguous, as a large portion of the mileage may be with light trains, or with very heavy ones, as the case may be. Then there may be a condition when the firebox needs renewal, from some sudden failure, the engine having made not over 30,000 or 40,000 miles since being overhauled, whereas the machinery may be good for six months further work.

In order to provide for these contingencies as well as to keep track of the work which the engine has done, the writer introduced the cards shown below, in addition, of course, to the monthly condition statements.

Engine No.	Class	on	Division.
in	service	miles since General Repairs	
should go to	Shops	for	
Boiler Repairs			
Flue Repairs			
Machinery Repairs			
Tire Repairs			
Wreck Repairs			
Engine is now		190.....	
	(SIDE A.)		M. M.

Engine No.	Class	Shops	190.....
Ordered to		Shops	190.....
Arrived at		Shops	190.....
Taken in		Shops	190.....
Ready for service		Division	190.....
Sent to			
Remarks			
Cost of Repairs		\$.....	
	(SIDE B.)		

As the locomotive approached the condition where a shopping was needed, a card was filled out (see side A) by the Master Mechanic to whom the engine was assigned, giving the general details of repairs needed, the mileage made since last general repairs and present location of engine and shop to which, in his judgment, she should be sent, and this was mailed to the superintendent of motive power. These cards were to be sent in at least a month (if possible) before the engine should be withdrawn from service, and especially if the grade of repairs necessitated sending the locomotive to a large shop on another division. This afforded opportunity to properly regulate the class of work sent to the different shops, and to give special instructions regarding the repairs. It also called attention to the mileage made, and if this was small gave a chance to call for explanations as to the condition of the engine.

Side B was used while engine was being shopped, and when completed the time and cost of the work indicated whether the instructions had been complied with or not. These cards were filed in a "card index tray," and thus the last shopping of any engine, with cost and other general points, could be immediately ascertained, and when the next card arrived indicating that a shop period was needed, this and the previous card gave very valuable information regarding the engine. While \$750 might have covered the cost of general repairs some years ago when locomotives were much smaller than they are now, and when labor and material were both lower in price than at present, comparatively little can be done for that sum at this time. From a statement before us, made in 1902, one of the best managed roads in the northwest shows \$1,000 for general repairs for some 17 by 24 in. engines, which were supposed to represent average conditions. For 19 and 20 in. cylinders the repairs run higher—\$1,200 to \$1,500 per engine. When a new firebox is needed these figures are increased by from \$500 to \$1,000, depending largely upon the necessary boiler work accompanying the insertion of the new firebox, as at times it is found advisable to renew certain steel sheets which have deterior-

ated. In the southwest where labor is much higher paid and often not so effective, the cost is likely to run 10 or 20 per cent. greater.

The relative proportions of labor and material entering into the cost of repairs are, of course, not fixed, and vary usually from equal halves to two-thirds and one-third; that is, the cost of labor will ordinarily lie between 50 and 66 per cent. of the total cost of repairs. There are cases when it may be less, or more, but we think an assumption of 60 per cent. for labor and 40 per cent. for material will not be far from the general average. When locomotives are rebuilt, that is, receive new boilers and many parts of machinery, the cost may run up to 30 or 40 per cent. of the original price—in some cases more, depending entirely upon the nature and extent of the work done.

It has been generally recognized that the last few years have been extremely expensive ones for the railroads. In a communication to the Railroad Commissioners of Texas addressed by the International & Great Northern Railroad in 1903, the statement was made that during the past five years the average wages of employees had increased 15 per cent.; prices of material had increased 53 per cent.; prices of locomotives, 56 per cent., and prices of cars 26 per cent., yet in the same period the freight rates had decreased on an average of 21½ per cent. These increases have been a source of much anxiety to railroad officials, and the only method of offsetting these conditions is in the erection of modern shops and the purchase of up-to-date machinery. This means a large outlay, but it is well justified by the results if made with discretion.

Of course, the size of the engine must be considered, as a large locomotive cannot be overhauled for the same cost as a small one, and the repairs should be considered in connection with the work accomplished. The old method of basing repairs on the engine mileage is really of little value unless the size and power of the engine be also considered. On the other hand, the ton-mileage is not altogether satisfactory for two reasons: It does not cover light engine mileage, which certainly causes some wear to the parts, and it does not tell us whether the full power of the engine has been in use, or only a part of it.

If the general repairs of a locomotive cost \$1,000 and cover a period of 100,000 miles, the rate for such repairs will be one cent a mile. (This does not include running or roundhouse repairs.) If the firebox must be renewed every 100,000 miles, which actually occurs under some adverse conditions, the rate will run 1½ cent or more per mile. In sandy sections and on heavy grades, the mileage may run only 50,000 or 60,000 miles between such repairs, increasing the cost to 2 or 3 cents a mile. In some bad water sections, flues have been renewed every 90 days, or say 10,000 miles; as this costs in the neighborhood of \$300, the flue work alone will add 3 cents a mile to the repair charges. Of course, the obvious remedy is to treat the water so that the flue trouble will not exist, but then we may get into transportation difficulties even more troublesome. In fact, there is perhaps no locomotive account that depends upon the physical conditions of the road and the manner of loading and operating the engines as much as does the cost of repairs.

The method of treating the engine after it has been brought into the shop is also very important. It is well-known that the longer an engine remains in the shop the more it will cost, largely due to the fact that the ordinary mechanic has little interest in the accurate distribution of labor, and also to the tendency to "find work" to do as long as the locomotive remains in the shop. Remarkable improvements both in time and cost of doing work have been made by a system of scheduling the work beforehand, and providing each department with a date when the different important parts *must* be ready. This insures smooth and uniform progress of the engines through the shop, and avoids the delay due to waiting for materials from the different departments.

In one of our large shops in the northwest where this system has been in conscientious operation for four or five years, the time of general repairs has been reduced from one month to 13 days, and yet this shop is not provided with traveling cranes, nor is the work paid for by the piece. This is merely referred to in order to illustrate the importance of proper system and organization in all branches, if the best results are to be attained. Of course, modern machinery must be provided, and high speed tool steel, with the proper help for the foreman to see that all tools are constantly running at the correct speed, as no matter how ample the facilities, if an efficient *personnel* is lacking, the shop cannot be a success. Examples of this are seen at the present time, where in spite of the expenditure of large sums for improvements, the output of the new shop is very discouraging, and is a source of adverse criticism to the motive power department.

Complete co-operation is necessary between all the departments, and probably nothing inspires this quicker than regular meetings of the shop foremen, with the master mechanic, where improvements in the service and modern shop practices are freely discussed and trials of same encouraged. The manufacture of repair parts in large quantities reduces the unit cost, and makes necessary turret lathes and duplicating machinery. The scrap pile af-

Back of Time Freight Waybill Envelope.

Agent will enter on these lines any special instructions following car

classification, but the authority must in each instance be shown on the red time freight envelope.

It takes six days for one of these time freight trains to make the run from St. Paul to Seattle, and for convenience and identification of trains the company uses a code of symbols entirely distinct from the other symbols applied to the individual cars of time freight. One of these keys of train symbols is illustrated herewith. Train No. 401 leaving Willmar on the eighth day of any month would be reported as 401 K, and it would receive that same name at the other stations shown for that run, Breckenridge, Williston, Spokane, Delta, etc. Train No. 401 leaving Willmar on the twenty-first day of any month would be reported straight through its trip as 401 XG. A similar schedule is provided for train No. 402 eastbound, and the same letters are used to designate the same day in the month. In addition to this train designation two letters combined and a series of numbers are assigned to each symbol station and two symbol letters and one number are used for each car of time freight, similar to the practice on the other roads hitherto reported. For example, Barnesville, Minn., is B N and has the numbers 1 to 25. Minneapolis, Minn., is M A, and has numbers 1 to 750.

It is provided that time freight shall not be placed under symbol when it originates on and is destined to points on the same operating division or conductor's run. Agents at non-symbol stations originating time freight notify the division superintendent by telegraph and in the absence of special instructions forward the cars in local trains, notifying the agent at the nearest division terminal or junction symbol station through which the car will pass. An agent so notified applies symbols to these cars in the same manner as to cars originating at his station. A red time freight envelope which has been discarded by some of the other railroads whose systems have been described is used on the Great Northern, for each car, to contain waybills. It is provided that in no case shall the waybills for more than one car be placed in the same envelope.

The set-out report, passing report, notice of detention and consist report, which make up the principal working forms of the system, differ in no essential from those already shown, and consequently are not reproduced herewith. There is an interesting difference in practice, however, as regards the graphic method of tracing the train in the superintendent of car service's office. The train board in use by the Chicago & North-Western was shown last week. The Great Northern also makes use of a time freight board, which is about 16 ft. long and is divided into sections representing each operating district or division, the names of all the principal terminals being shown on it; but small iron rods run across the board and on these are carried boxes containing the car number, each box representing a train. The upper half of the board is used for eastbound trains and the lower half for westbound trains. The symbol numbers are placed on blocks instead of on small plugs, as is the usual custom. One of these blocks is illustrated herewith. The symbol number, which in this case is M A (Minneapolis) 58, is placed on the end of the block, and the block carries a number of paper slips, on the uppermost one

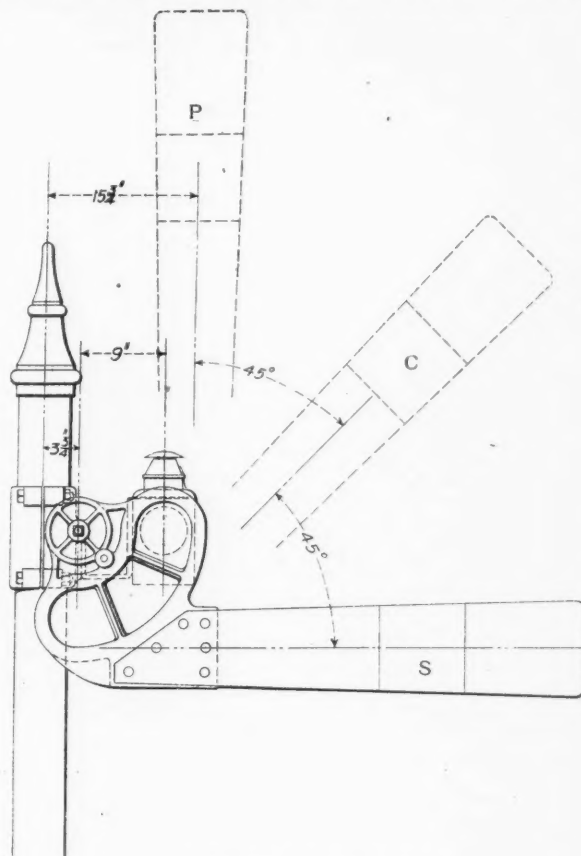
of which is noted all necessary information, such as the car number, originating point, contents, destination and memorandum of delays. The company considers this plan much superior to the old method of using the small wooden plugs (see Chicago & North-Western last week), as all the necessary information is carried with the symbol number, and no time is lost in looking up information relative to delayed cars.

For particulars regarding this time freight system we are indebted to F. Bell, Superintendent of Car Service.

A Proposed Semaphore.

Committees of signal engineers of the New York Central lines, including roads west of Buffalo, and of the Pennsylvania lines, including roads west of Pittsburgh, in joint conferences have recently been discussing improvements in signal practice and have considered, with a good deal of favor, a proposition to have all semaphores so changed in design that the all-clear indication shall be given by inclining the blade upward instead of downward, as is the case at present on all American railroads. With a two-position signal this scheme would provide for a horizontal blade to indicate stop and a blade inclined upward 60 or 70 degrees for all-clear. In a three-position signal the arrangement would be horizontal for stop; 45 degrees upward for the cautionary or distant indication and 90 de-

grees upward (vertical) for all-clear or "proceed." The inclination 45 degrees upward is in use for "caution" on the Erie and the Atchafalaya, and has been thus used for 15 years or more. One of the three-position designs which has been considered by the committees is shown in outline herewith. The chief reason advanced for abandoning the downward and adopting an upward inclination is that with the latter a breakage or failure is more certain to throw the signal



A Proposed Semaphore.

S = stop. C = caution. P = proceed.

to the stop position without the aid of a counterweight. Accumulations of sleet, which under present practice tend to throw the signal to the all-clear position, would tend to throw it to the stop position.

Superannuation Fund on the New Zealand Government Railways.

The provisions of the Government Railways Superannuation Fund Act, which went into operation in New Zealand at the beginning of 1903, are unusually liberal, as will be seen from the following digest supplied us by Mr. T. Ronayne, General Manager of the New Zealand Railways, on the occasion of his recent visit to this country. The fund consists of contributions from persons employed by the department, of money now in the Railway Service fund; of fines and penalties which would hereafter be payable into this fund, except for the passing of the Act; and of interest accruing from investment. Every person who at the commencement of the Act was permanently employed in any capacity by the department was given the right at any time within the ensuing six months to become a contributor to the fund. Those who did not elect so to do are debarred from becoming a contributor to the fund at any future time, or from participating in its benefits. All persons permanently employed in any capacity by the department after the law went into effect, however, are required to contribute to the fund as a condition of their employment. The contribution from members is deducted at each monthly accounting period and is based on a percentage of pay received. This amounts to 3 per cent. if the age of the employed is not more than 30 years at the time when the first contribution becomes payable; to 4 per cent. if his age is between 30 and 35; to 5 per cent. if it is between 35 and 40 years, 6 per cent. between 40 and 45; 7 per cent. between 45 and 50, and 10 per cent. if above 50.

The fund thus acquired is administered by a board made up of nine members, including the Minister of Railways, the Solicitor General and the General Manager of Government Railways. Every contributor whose length of service in the department is 40 years or over, or whose age is 60 years or over, may at any time retire from the service of the department at the expiration of three

months' notice of his intention to do so, and is thereupon entitled to receive from the fund an annual allowance for the rest of his life. It is stipulated that for every year of service in the department he shall receive one-sixtieth part of his annual rate of pay, but in no case shall the total yearly allowance exceed two-thirds of such annual rate of pay. It is also provided that the board may extend the provisions of the superannuation to cases where the contributor's service is not less than 35 years but does not amount to 40 years. A contributor who retires with the consent or by the direction of the Minister on the ground of being physically unfit for further duty is entitled on his retirement to receive an allowance for the rest of his life as stipulated above. It is provided that if any contributor voluntarily retires from the service of the department before becoming entitled to a retiring allowance under the act, or if his services are dispensed with from any cause other than misconduct, he shall be entitled to a refund of the whole amount actually contributed by him to the fund, but without interest, together with any compensation to which he is entitled under the Government Railways act of 1887. Contributors dismissed or those whose services are otherwise dispensed with from misconduct are likewise entitled to a refund of the entire amount which they have actually contributed, computed without interest. In the event of the death of a contributor before retirement his legal representative receives the entire amount paid in without interest, in the same manner as with one who voluntarily retires prior to the expiration of his time. But if such contributor dies leaving a wife or children who survive him, then in place of such payment to his legal personal representative it is provided that there be paid to or for the benefit of the widow during her widowhood the annual sum of £18, with an additional sum of 5s. a week for each child until the child is 14 years old. These annual payments are to be made at the discretion of the board, but in no cases shall payments be at longer intervals than four weeks. The widow has the option, however, of receiving in a lump sum in place of this allowance such portion of the amount of contributions actually paid by the contributor to the fund and of the compensation to which the contributor was entitled under the provisions of the Government Railways Act as the board may determine.

If at any time the pay of a contributor is temporarily stopped by the department on the ground of ill health he is allowed to continue to contribute to the fund and his rights to the benefits provided are not affected by the stoppage. With regard to determining the annual rate of pay as mentioned in the previous paragraph, it is provided that this rate shall be taken as the rate the contributor was receiving at the time of his retirement, unless within the previous five years he had served in a lower grade. In that case, the average rate during the seven years next preceding his retirement is taken. But where a contributor's pay is temporarily reduced, or where through age or infirmity he is transferred to a subordinate position to that which he previously occupied, his retiring allowance is computed on the maximum rate of pay he received before such reduction or transfer.

At times when the fund is unable to meet the charges upon it, the board is instructed to set forth the fact to the Colonial Treasurer, stating the deficiency and the causes, and the Treasurer is authorized to make good the deficit without further authority. Retiring allowances and other money granted under the Act cannot be assigned or in any way alienated from the grantee and these grants are not subject to the Bankruptcy Act of 1892.

A servant girl riding in a third-class compartment in Hungary carried with her three gallons of alcohol in a demijohn which by

some accident broke, so that the alcohol ran over the floor and also into the adjacent compartment. There a countryman touched it with a lighted match "just for fun," to see if it would burn. It did burn, and so did the car and the next one, and the poor girl and two other passengers.

Automatic Block Signals on the Erie.

The Hail Signal Company has taken an order from the Erie Railroad for equipping with automatic electric motor semaphore block signals its line from Bergen, N. J., two miles from the Jersey City terminal, westward to Middletown, N. Y., 66 miles. The contract covers 175 miles of track. There will be 82 single-arm and 33 two-arm signals. In blocks more than one mile long, the distant signals will be on separate posts, but between Bergen and Suffern the blocks are shorter and distant and home signals will be on the same post. The lengths of the blocks vary from three-fourths of a mile to 1 3/4 miles. This is the first important installation of automatic signals which has been made by the Erie, and the new signals will, for most of the distance, displace controlled manual block signals. The automatic block signals are to be worked by storage batteries charged by wire lines from generating stations at Rutherford, Ridgewood Junction, Suffern, Oxford and Middletown. A portion of this line is four-track, and on this portion bracket posts will be used. Parts of the line close to the eastern terminus have been four-tracked for many years, and the present signals are on bridges; these bridges will be retained. The Sykes lock and block apparatus, which is to be displaced, has been in use about 18 years, and much of it had reached the age at which it would soon need to be renewed.

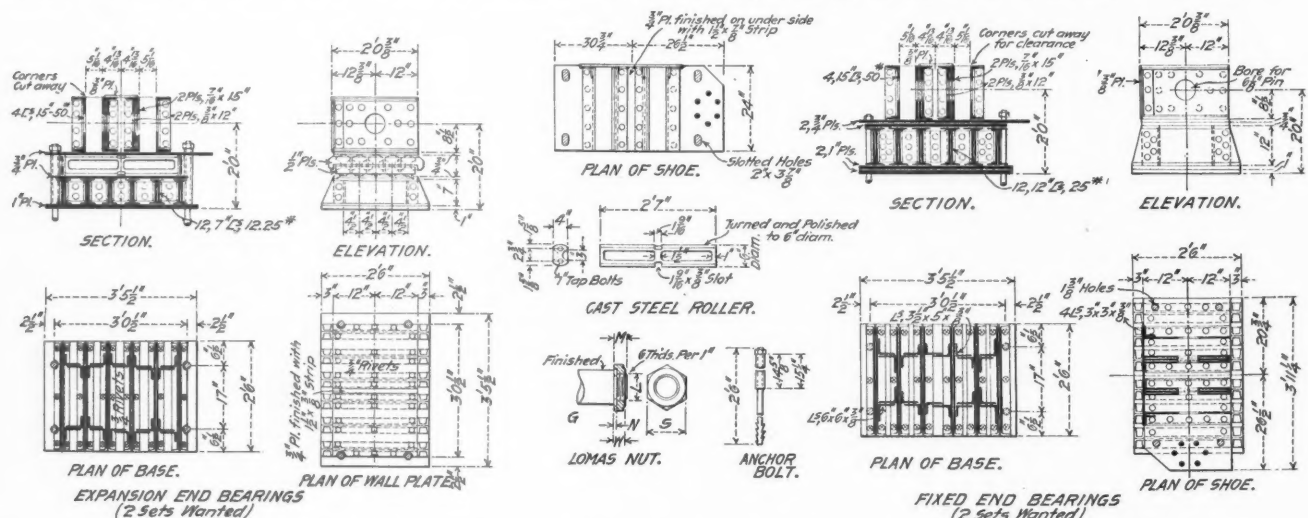
The five charging stations have each a 500 volt, three k.w. direct current generator operated by a gasoline engine. The charging lines will be No. 10 hard drawn copper wire. The contract also calls for 95 electro-mechanical slots for existing signals and 27 highway crossing bells.

The Hall Company has also closed contracts recently with the Chicago & Alton, the Union Pacific and the Alabama Great Southern.

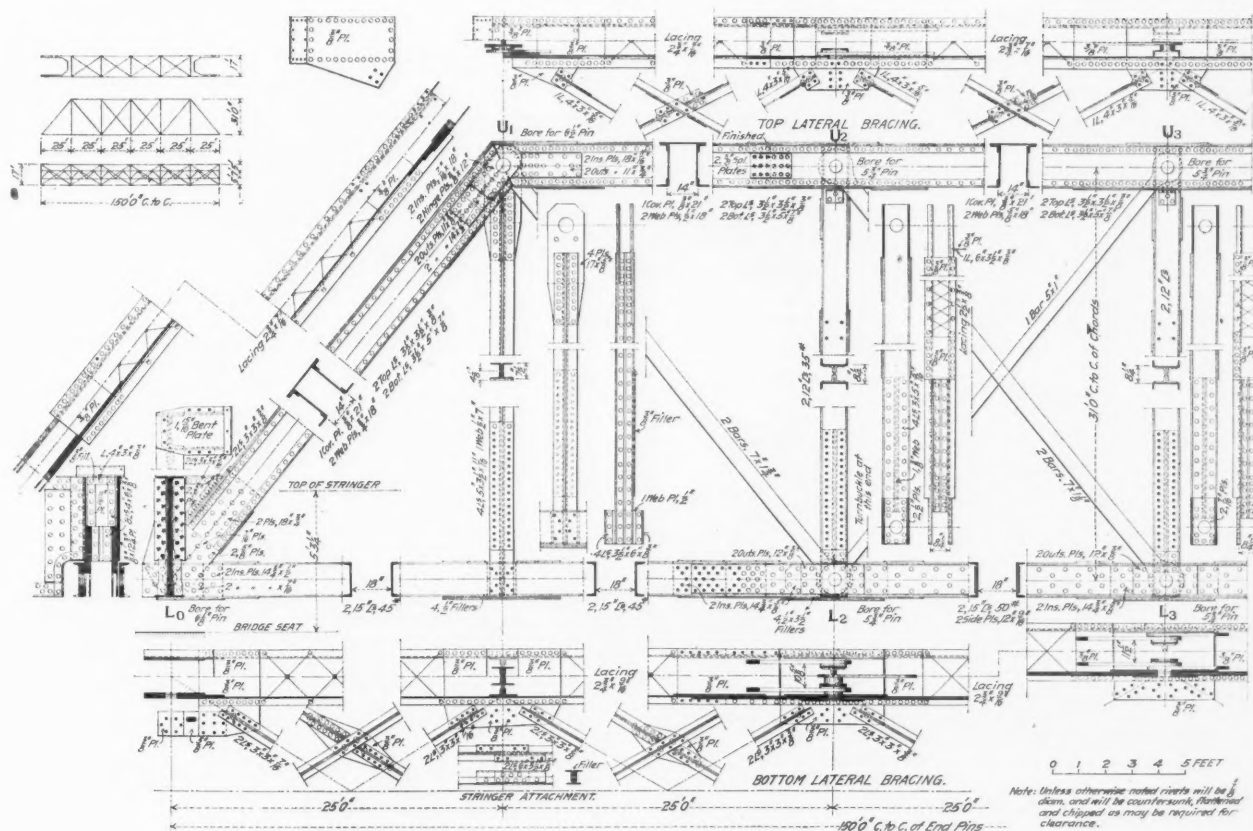
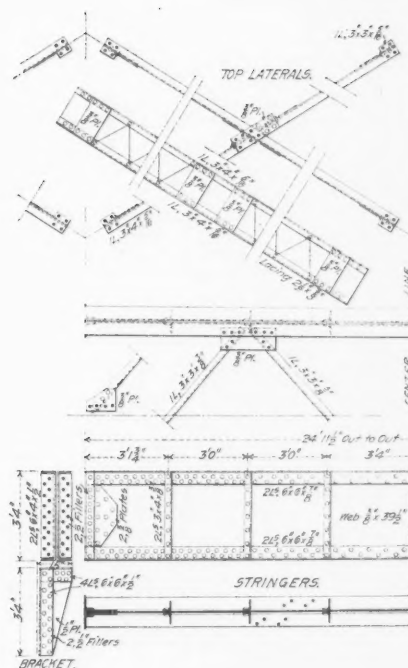
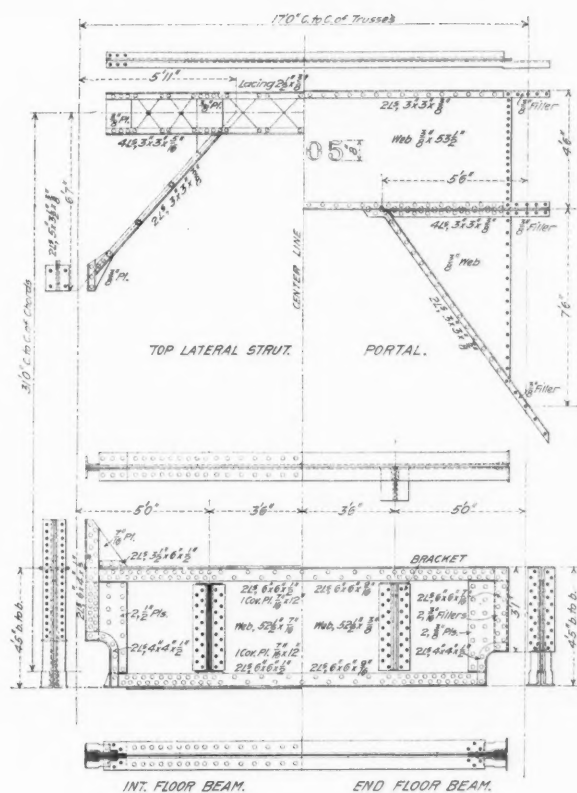
Standard Bridges on the Harriman Lines.*

The 150-ft. span through pin-connected truss bridge illustrated this week is the first of the Harriman Lines standard designs shown for this type of bridge. There are six panels, the two center panels have double diagonals, one of which consists of two bars 7 in. x 1 1/2 in. and the other of a single bar 5 in. x 1 in. The intermediate panels have single diagonals each 7 in. x 3/4 in. The top chord is built up of a cover plate 21 in. x 3/8 in.; two webs 18 in. x 1/2 in. spaced 14 in. apart; two top flange angles 3 1/2 in. x 3 1/2 in. x 3/8 in., and two bottom flange angles 3 1/2 in. x 5 in. x 3/8 in. The end diagonals are fabricated in a similar manner to those shown in the 150-ft. riveted through truss bridge which was illustrated last week, the only difference being the distance between and in the thickness of the web plates, which are spaced 14 in. apart instead of 13 in. and are 3/4 in. in thickness instead of 5/8 in. The bottom chord is made up of two 15-in. 45-lb. channels and two 12-in. x 1/16-in. side plates. The estimated weight of one span complete is 304,000 lbs. as against 311,000 lbs. for the 150-ft. riveted through truss span shown last week.

*Previous articles appeared in the Railroad Gazette March 17, 24, 31, April 7, 14, 21, 28, July 28, Aug. 11, 18, 25, and Sept. 1.



Details of End Bearings for 150-ft. Through Pin-Connected Span—Common Standard, Harriman Lines.



Details of Trusses and Floor of 150-ft. Through Pin-Connected Span—Common Standard, Harriman Lines.

Raising a Bridge—A Quick Job.

F. H. Bainbridge, Principal Assistant Engineer of the Chicago & North-Western, sends the accompanying photograph to show the raising of a railroad bridge on the Galena division, south of Nelson, Ill. The bridge spans Five Mile Creek, and is a through plate girder 69 ft. long. It was raised with the ties and rails complete, weighing in this condition 113,450 lbs., to provide passage for a dredge increasing the waterway in the creek, and it was of course important that the delay to traffic should be as slight as possible. To raise the bridge quickly and economically, the galleys frame, bents and braces were built up of second-hand 8 in. x 16 in. bridge stringers. The height of the bents was 40 ft. and the total raise was 30 ft. The bridge was raised with four sets of blocks consisting of one 5-sheave block and one 4-sheave block, making a nine-part line. The hoisting lines were handled by two 7 in. x 10 in. double-cylinder double-drum engines, one at each end of the bridge. This equipment was taken from the ordinary bridge erecting derrick cars belonging to the Chicago & North-Western.

The track was cut at 9:02 a. m. on July 18 and the dredge



Lifting a Bridge to Pass a Dredge, Chicago & North-Western.

started at 9:12 a. m. The dredge had two breakdowns on passing through the bridge, but cleared the bridge, proceeding with its excavation at 5:25 p. m. The bridge was lowered again at 5:40 p. m. and the track was ready at 5:55. The work was done by the Engineering department of the Chicago & North-Western, Mr. Edward C. Carter, Chief Engineer. Mr. J. S. Robinson, Division Engineer of the Galena and Madison divisions, had charge of the work.

Railroad Valuations in State Reports.*

Generally speaking, the character of the information contained in state reports is determined by the law. When reports are fragmentary, and give only slight and unsubstantial data; when values of one part of the property are given in great detail, while those of another part are entirely ignored; when important steps in a system of valuation are omitted from the record, it is not, as a rule, the administrative officer to whom blame, if blame there be, should be attached, but the law. A word, then, must be said, by way of general introduction concerning the various systems of valuation provided for by the laws of the several states. These systems of valuation vary with the nature of the tax or taxes imposed.

Railroads are taxed either upon an ad valorem or upon a specific basis, or upon a combination of the two. The ad valorem taxes fall into two classes: First, taxes on the value of real and personal property; second, taxes on the value of stocks or bonds or on valuation based on earnings, dividends, or other results of operation. The specific taxes fall into three classes: First, taxes on stocks, bonds, loans, etc.; second, taxes on gross or net earnings, revenue, or dividends; third, taxes on traffic or some physical quality or property operated, or on privilege.

*Abstract of a report by Prof. Harold M. Bowman, made for Bulletin No. 21, of the Census Bureau. This Bulletin, giving the total valuation of the railroads of the United States (eleven billion dollars) was noticed in the *Railroad Gazette* of Aug. 18 and 25.

How, then, do these various kinds of taxes affect the systems of valuation? The ad valorem tax *eo nomine* predicates an appraisal by administrative officers. The specific tax imports a legislative or anticipatory valuation. Legislatures obviously adopt this or that specific tax for no other reason than that it provides a relatively sufficient measure of value. The state constitution permitting, the legislature may adopt the par value of bonds and stocks as a basis; it may declare gross or net earnings the proper test; it may reject both and find in the number of cars owned, the number of miles operated, or the number of passengers carried, what it considers the true key to the value of the road.

This distinction should be thrown into clear relief, for it affords the basis for the criticism of railroad valuation in the states, and consequently, also, for a criticism of the administrative reports relating to valuation. If the tax is a specific tax, the responsibility for the value of railroad property is chiefly, if not entirely, legislative, except in so far as the classification of the railroad within the state rests with the administrative authorities. If the tax is ad valorem, the responsibility for the valuation is primarily administrative, for administrative authorities, being empowered to appraise property, may exercise discretion, and within the limits of that discretionary power they are responsible.

The Administrative Reports.—The statements of railroad valuation in the states, so far as published, are found in a variety of reports: Auditors' reports, reports of boards of assessors, of boards of equalization, of boards of public works, of comptrollers, corporation commissioners, governors, railroad commissioners, secretaries of state, treasurers of state, and tax commissioners. In some states all available information is contained in a single report, usually the auditor's. In other states the facts are found in two or more reports; but seldom, even in the entire range of reports of a given state, can full and adequate information of railroad values be found.

If the law calls for the ad valorem taxation of all the property, real and personal, of a railroad, there should be a record of that value somewhere. To be of any general use it should be found in state records and reports. It would be unreasonable to ask any one to seek his information first hand from county and city records.

And yet in many cases the investigator is put to exactly this inconvenience. It is not uncommon for state officers to reply: "We do not know the value of the railroads in our state"; or, "We cannot find out; we have not the means of ascertaining such value." These admissions may mean various things. In some cases they probably mean that administrative officers are indolent or incompetent. In some cases they mean that the state has been niggardly in its appropriations for a very important service. But as a rule, perhaps, they mean that the machinery of the law has not been adjusted to the conditions.

The reports of eight out of the fifty states and territories give no information as to the value of railroad properties. It is true that in most of these states the ad valorem tax is a secondary tax, but this does not excuse the absence of information. Even where secondary, the tax is of importance. In some cases it is of great importance; as in Maryland and Massachusetts, not to mention others. Five states and territories fail to give the values of railroads individually, but give the value of a part or all of the property of all railroads collectively. In Texas, however, the railroad commission has made some progress, taking up a part of the railroad individually each year and appraising their value. These values are reported.

The remaining states and territories, thirty-seven in number, give the values of a part or all of the property of each railroad individually. In many of these states the information is only partial information. In the great majority of them no information is given as to the property not used in operation, or the reports so combine it with other facts as to make the true contents of the report a matter of speculation. And in numerous instances the information is not labeled in such a fashion as to make its significance in the administrative process of valuation apparent.

Information is given by some reports with reference to the value of sleeping car and freight line and equipment companies. Out of eighteen states, which apparently impose a tax on the value of the real and personal property of such companies, ten states give partial or complete information as to the values, while eight states give no information at all.

Reports relating to the values of stocks and bonds are even more defective. Thirteen states impose such a tax either upon rail-

road or sleeping car and similar companies, or both; four of them give information as to the values on which the tax is based (though in one of them the information is given only for one class of companies, viz., the railroads, whereas the tax is on both railroads and sleeping car companies); nine of them give no such information.

These facts, in respect both to railroads and sleeping car and like companies, speak to a large degree for themselves. Of the states having ad valorem taxes on real and personal property of the companies in question, 16 per cent. give no information whatever as to railroad values, 26 per cent. give no information as to the values of individual railroads, while the 74 per cent. which do afford information as to individual roads give only a very imperfect and incomplete record. Add to this the fact that 43 per cent. of the states having ad valorem taxes on sleeping car and freight line and equipment companies give no information as to the values thereof, and the further fact that of the states having a tax on the value of stocks and bonds only 31 per cent. give such values, and the hopelessness of ascertaining the most essential facts regarding railroad valuation from administrative reports is apparent.

In the case of the specific tax on the par value of stocks and bonds we should expect to find such par value given. In the case of the specific tax on gross or net earnings one might reasonably expect to find information as to such gross or net earnings, and if the rate varied or were graduated, the facts which afforded the basis for such variation or graduation. In the case of the specific tax on physical quality or property operated, or privilege, one would expect to find facts concerning the amount of traffic, the physical character of the road, the cars run, and freight and passengers carried, or the nature of the privilege; but here, even more than in the case of the distinctly ad valorem tax, there is a dearth of information.

Five states impose the tax on the stocks or bonds, or both stocks and bonds, or railroads, etc., but not one of them gives any information, placed in authoritative relation to taxation, concerning their par value or the amount of stocks and bonds taxable.

Thirteen states impose the tax on gross or net earnings of railroads, or sleeping car and similar companies, or both, but only five give any information as to such earnings. And of these five, two give no information as to the earnings of sleeping car companies, though they tax the same. Three give information as to the facts which determine the rate for the individual roads. The remaining eight states give no information as to earnings. Seven states have the specific tax on traffic, physical quality, property operated, or privilege, but only one of the seven gives any information as to the facts representative of value on which such tax is assessed.

Summarizing these results in the language of per cents, we find that of the five states having the first specific tax, none gives information as to the valuation on which the tax is ascertained; of the 13 having the second specific tax, only 38 per cent. give information; and of the seven having the third specific tax, only 14 per cent. give information as to the facts representative of value.

Methods of valuing railroad property.—Though conspicuous defects still exist in the various systems of valuation, substantial progress has been made during the past score of years. Until recently railroads were valued according to what has been described as the "primitive" method. That is to say, railroads were not distinguished from other property. Thrown into the general mass, the right of way and the farmer's turnip patch were treated as homogeneous; railroad rolling stock and mechanics' tools as like property. All were appraised by the local assessor. There was no central state valuation of any part of the property. This system still persists in certain states. Wherever it is found the administrative reports of railroad valuation are, as a rule, hopeless, no satisfactory information as to railroad values being found in them.

The next step in advance, beyond which many of the states have not gone, was the provision for the valuation of a part of the property by a central state board or officer, the other property being valued by local officers. The principles for the division or distribution of property for local and central assessment are quite various, showing little or no fundamental consistency. Some states provide that all the rolling stock shall be appraised by a central board, all other property by a local board. Some provide that all property used in operation shall be appraised centrally, only the property not used in operation locally. In some cases the law makes a distinction between various classes of railroad realty and personalty, providing, let us say, that the roadbed, right of way, and rolling stock shall be appraised by central authority, while stations, machine shops, fixtures, furniture, etc., shall be assessed by the local officers. The weaknesses peculiar to this system of valuation arise very largely from the possibility of conflict and the dissipation of energy. So far as the appraisals are made by local assessors, this system presents all the evils of the primitive system. So far as the appraisals are withdrawn from local assessors, beneficial results seem to follow. If a great body of assessors, independent the one of the other, stretching over the length and breadth

of the state, value different parts of the property, the results are inevitably inharmonious. The ratio of actual to assessed value varies in different sections of the state, and equalization does not redeem the case even when the equalization addresses itself to the railroad properties as a distinct group, which is an unusual thing. Moreover, the technical difficulties of distinguishing the several elements of railroad personality and real estate used in operation, where the law requires a distinction, are difficulties with which the local assessors cannot easily cope. All the economies of information, experience, and wise deliberation which centralization secures are wanting here. The state reports stand as a lasting monument to the errors and losses of this system of railroad valuation.

Some states have gone a step further, providing that all railroad property shall be valued by a central board or officer. Several states have endeavored to attain this end but have fallen somewhat short of it because constitutional provisions have stood in the way.

The most marked tendency in the development of the laws of railroad valuation has been centralization. Its advantages are apparent. It economizes effort, unites forces, focuses all the information accessible, makes possible expert investigation, fixes responsibility, and gives room for the development of scientific method. Let it have its defects. A small body may be more easily corrupted than a large one. A small body of assessors may become a cog in the political machine, whereas a large number of officers, varying in their political affiliations and allegiance, will maintain a comparative degree of independence. The composition of the central body is frequently open to objection. But experience indicates that the advantages of the centralized system greatly outweigh its disadvantages.

Defects in reports of valuation.—It is, as a rule, impossible to tell from the reports whether the railroads have been appraised at their actual value or not; and frequently the law itself will afford no assistance in this matter, for there are cases where the law has required that railroads should be assessed at their actual value when in fact they have been assessed at a much lower value. This is one of the greatest failings of the reports. It makes it impossible either to arrive at the true value of the road or to make any comparison with the values of other properties.

Almost without exception, no information is given as to whether the assessed value of railroad property bears the same relation to the true value, that the assessed value of other property bears to its true value. Sometimes the reports make it uncertain as to whether the railroad company itself or public officers have made the assessments, or whether self-assessment was resorted to.

Values for a part of a railroad—e.g., that part within given counties or cities—are sometimes given without any accompanying statements as to the value of the entire railroad property in the state. This often results in only a partial inventory of values. The reports uniformly fail to indicate the extent to which statements of values made to officials by railroad companies are overhauled by such officials.

Cases appear where the courts of a given state have held that even in the case of a distinctly ad valorem tax on real and personal property, the valuation might be based on the aggregate market value of stocks and bonds less debts due creditors within the state. And yet the reports fail to indicate to what extent this method of valuation is employed. It seems quite obvious that a certain part of the property, that denominated "real estate other than main stem," which the law requires to be assessed locally, could not well be valued in this way. And yet there is nothing in the reports to indicate that market value of stocks and bonds is not the measure for this item as well.

Reports may be found giving the values of "special franchises" without discrimination as to which of such franchises are represented by railroad privilege. Of course this makes the information absolutely useless from the standpoint of railroad valuation.

Defects in classification.—It is no unusual thing for a report to arrange the railroads in such a way as to show no relation between the branches and main line of a system. Branches are sometimes treated as co-ordinate with main lines. Sometimes the facts concerning the parts of a given road are entirely separated by intervening data, without any indication whatever as to the relation of the one to the other. Moreover, transportation companies are sometimes listed in a fashion so regardless of distinctions and differences that it is impossible without outside investigation to ascertain which of them are railroads, which surface car companies, which express companies, and which water transportation companies.

Weaknesses in distinctions are very common. For instance, reports frequently give only a general "track value," failing to indicate whether it is confined to main track, or includes side track, switches, etc., as well. Of course in such cases separate values of main track and other track are not given.

Again, in some cases the value of the property of sleeping car companies may or may not be included in the reports of assessing board or officer. In the case of omission, no reason is given there-

for in the report. Values of franchises are sometimes given without anything in the law or reports to make clear exactly what property is covered by such reports. The term "personal property" is at times used ambiguously. Values of separate items, such as "roadway," "roadbed," and "rails" are in some cases reported without any key to the exact distinction between them.

The tabulations are oftentimes crude, the arrangement of items being so confusing as to neutralize the effect of good distinctions. Take, for example, a case where the item "value per mile" is placed in such a position with relation to other items that it might be held to indicate either "main line" or "rolling stock." Oftentimes failure to give sufficient detail makes it uncertain just what property a rather general item includes. For instance, the description "valuation of main line" may, in certain cases, prove very misleading, for we find cases where it refers to roadbed, right of way, and track only, and other cases where all these items are included, and rolling stock, franchises, etc., as well. The case is quite as difficult where assessing bodies profess to state in great detail the values of the various elements, and do so for the most part, but entirely omit some important item, such, for example, as "rolling stock," without an intimation as to whether it is contained in any other item.

Defects in tax statements.—In some cases the determination of the tax to be paid and the statement of such taxes help materially in the solution of questions of valuation. For example, there may be cases when the capitalization of the tax will represent value with a fair degree of accuracy. But even in this branch of the reports there are frequent defects, obstructions, and obscurities. One of the most common criticisms to be offered is that of failure to indicate whether statements made are only of taxes paid or are of taxes payable. Sometimes taxes several years past due creep into reports that purport to be reports of taxes currently assessed and currently payable. We find states where certain subsidiary lines pay taxes and the main line does not; and yet no explanation of the peculiarity is offered. Some statements prove to be but partial statements of all the taxes payable by a railroad in the state, but to all appearances they are set forth as complete statements. For instance, it is not unusual for only the state or the local taxes to be given, and yet the statements indicate that both are covered. On the other hand, we have cases where the officers do not give and do not profess to give anything like a full statement of taxes payable or paid. For instance, in one state the only facts that bear on railroad taxes at all are those given to show the account of a railroad with a certain fund.

Failure of facts.—In many cases the error or defect takes the form of absolute failure of facts, as suggested incidentally in preceding statements. As stated elsewhere, a most common case is that of the failure to give any information as to the property not used in operation. This is a chronic failing. Again, it is the rule for reports to fail to note that sleeping car, parlor car, and fast freight line and equipment companies have any property other than rolling stock. Seldom or never is any attention given to those peculiar cases in which a railroad within a particular state is valued in some way or at some rate different from other railroads. Occasionally assessors have been so careless as to omit the statement of the year for which their valuation was made.

In some states laws provide that the railroad shall be taxed on the par value of the stock if the dividends reach a certain point, otherwise on the market value. But the reports in such cases fail to indicate whether the road was taxed on par or market value, or what the market values were. There are instances where the laws make peculiar provisions for the assessment of roads located in only one county. But in such cases the work of the administrative officers, so far as made public, fails to show what roads are and what are not located in a single county.

The failure to give facts is often accounted for by the great tendency toward generalization, the sacrifice of detail. The cases are few in which there is considerable minutiae in the reports. For instance, the value of tools and machinery is seldom given separately. As a rule there is little or no distinction between the various elements in the real or personal property. There is but one state report in the country, for instance, which analyzes the rolling stock values in any great detail. The state in question distinguishes 30 different classes of cars, without exhausting the possibilities of the case. The failure of the states in general to make any detailed analysis of this character indicates the degree to which the systems of ad valorem assessment now in vogue must be reformed in case the inventory system of valuation is to be introduced.

Defects of the law.—Finally a word may be said concerning the laws themselves. And, after all, it is the law which shapes the foundations of the reports. There are laws that attempt a rule for the assignment of values within and without the state, yet leave the meaning of that rule in doubt; laws that prescribe, let us say, a mileage basis of apportionment, yet do not indicate whether the miles are miles of main track or not; laws that are uncertain as to which officer shall appraise a given part of the railroad property; laws that are fraught with ambiguity, and laws that, although the work of legislative experts, yet fail in difficult situations to grasp

the full meaning and significance of economic or financial principles. Such laws relating to railroad valuation could be cited without limit.

Conclusion.—To support the statements made regarding state reports a legion of facts are at hand and might be submitted. It is most evident that our systems of railroad valuation demand improvement. The steps toward uniformity that have been taken and are to be taken in the commercial law of our states should be urged in the administrative law. Not only should the administrative law as such be amplified and unified, but the unwritten custom of administrative officers, their ways and methods of reaching results and stating these results should be brought into harmony. One cannot study the laws of valuation and taxation and the work that has been done in the administration of them without feeling that there is something almost farcical in our present legislation and the practices and results to which it leads. The wastes and the inequalities violate principles of justice; the inefficiency of the laws is shameful. We should have more laws and fewer bargains in our statute books. And our laws once made should be administered, not manipulated. Both law and practice need improvement; the increase of administrative efficiency and the scientific betterment of the administrative law are both most necessary.

To pass from criticism and comment to the point more directly in hand, it is evident from the facts narrated why it was not possible to base a valuation of the railroad property of the United States upon the state report relative to the valuation and taxation of this class of property.

The Montreux-Oberland-Bernois Railroad.

BY FRANK C. PERKINS.

Bern, Freiburg and Waadt are among the most interesting cantons in Switzerland and many tourists visit the section. The electric mountain railroads are now in operation, and are all well patronized as the scenery is most beautiful.

Beginning at Montreux the Montreux-Les-Avants section of the Montreux-Oberland-Bernois road passes through a tunnel under the college and streets of the city, then mounts to the heights of the romantic castle Chatelard and passes through two tunnels to Les Avants, a distance of seven miles from Montreux. A magnificent view of Lake Leman and the surrounding country is to be had as the cars mount from 1,300 ft. above the sea at Montreux to 2,500 ft. at Chamby, and 3,200 ft. at Les Avants. One of the tunnels is 607 ft. in length and the other 453 ft.; and this section of the line has six viaducts and three iron bridges.

This electric line includes in its overhead construction steel poles 34 ft. long measuring 2 in. at the top and 3½ in. at the bottom, and weighing 53½ lbs. per meter. The overhead trolley wires are supplied with current at from 750 to 1,000 volts pressure from a sub-station located at Chamby. The lighting of the station and shops at Montreux is accomplished by five series of seven lamps each of 110 volts directly connected to the feeder conductors. The building is 118 ft. long and 49 ft. wide.

At Chamby a sub-station is provided with a machine room 1,500 sq. ft. floor space, and two storage battery rooms each having an area of 1,055 sq. ft.; also dwelling rooms for the engineer in charge. The electrical installation, including the transformers, transmission lines and trolley lines, as well as the electric cars and other rolling stock, was supplied by the Elektrizitäts Gesellschaft Alioth of Munchenstein-Basel, Switzerland.

The line from Montreux to Montbovon is 14 miles long and the line from Montbovon to Zweisimmen is 25 miles long, making the distance from Montreux through to Zweisimmen 39 miles. The difference in elevation between Montreux and Zweisimmen is 1,800 ft. There are 26 stations and stops between these places.

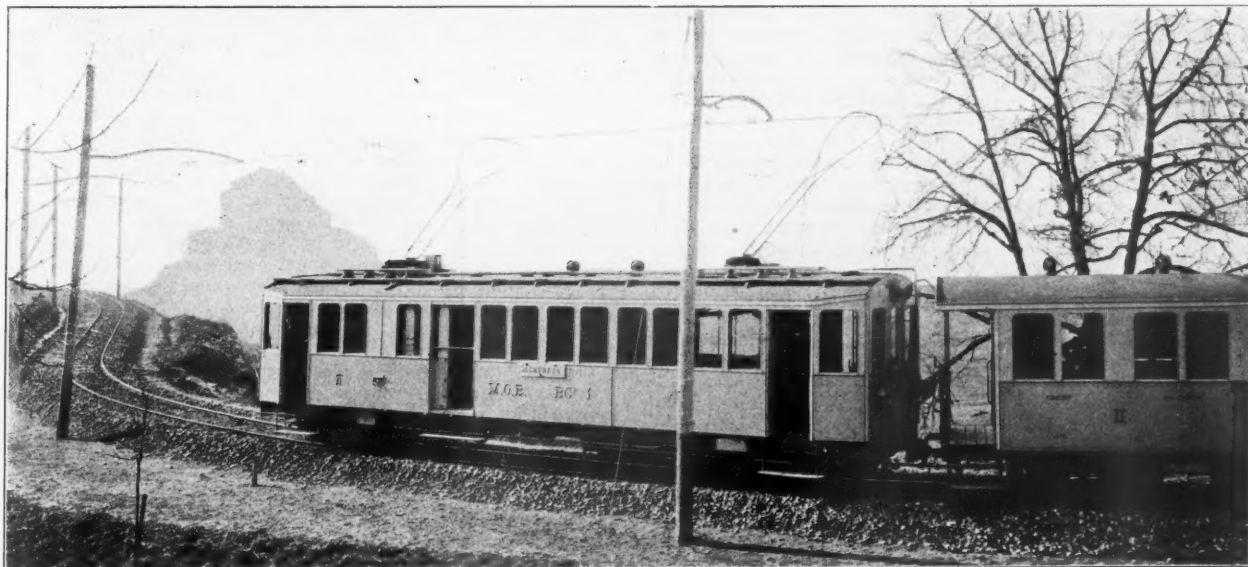
For this railroad the electric power is generated at two power plants, the Elektrizitätswerk Von Montbovon and the Hydro-Elektrische Zentrale von Hauterive. The Hauterive plant has a total capacity of 12,000 h.p. with a discharge of 777 cu. ft. of water and a fall of 16 ft. 5 in. The Montbovon power house has a net fall of 220 ft. with a water discharge of 212 cu. ft., developing 1,200 h.p. each with four units and 600 h.p. each with two units. The electrical generators are directly coupled to the turbines and are of the alternating type, supplying a pressure of 8,000 volts for the transmission line.

From Montbovon to the sub-station at Chamby the high tension transmission line is nine miles in length and consists of three conductors, each having a diameter of 6 mms. (about ¼ in.). At this sub-station there are three asynchronous Drehstrom motors, each having a capacity of 210 h.p., and operating at a speed of 430 r.p.m. directly from the 8,000-volt high tension current. To each of these three motors there is directly coupled a direct current dynamo of 140 k.w. capacity supplying from 140 to 187 amperes at a pressure of from 750 to 1,000 volts.

At a distance of 14 miles from Montreux the Montbovon sub-station is situated. It is equipped with three asynchronous three-



Tunnel on Montreux Railroad.



Montreux-Oberland-Bernois Railroad.

phase motors of 250 h.p. each. These motors also operate directly from the 8,000 volt line, and drive by direct connection three continuous current machines of 170 k.w. capacity at a speed of 430 r.p.m. These traction dynamos each supply a current of from 170 to 227 amperes at a pressure of 750 to 1,000 volts. The machines

and the wheels having a diameter of 840 mms. (33 in.). The commutator has 185 segments and the current is collected by two sets of three carbon brushes. These motors weigh without gearing 1,360 kgs. (3,000 lbs.). At first the two pairs of motors are connected in series and the controller connections are such that then

all four are operated in parallel. The Hardy vacuum brake utilizes an air pump driven by a 6 h.p. motor. The cars are lighted and heated by electric current, the energy used for heating being about 20 h.p. The motor cars are lighted by three series of seven incandescent lamps each.

For carrying passengers trailers are provided. These weigh 9.6 tons, with a total of 48 passengers, the weight being 441 lbs. per passenger. The freight trailer cars are 8 ft. 6 in. in width, and 24 ft. 6 in. in length. They weigh about eight tons. The line from Montreux to Montbovon cost about six million francs, and the cost from Montbovon to Zweisimmen was somewhat over seven million francs. The capital stock is 6,940,000 f.; bonds, 6,300,000 f.

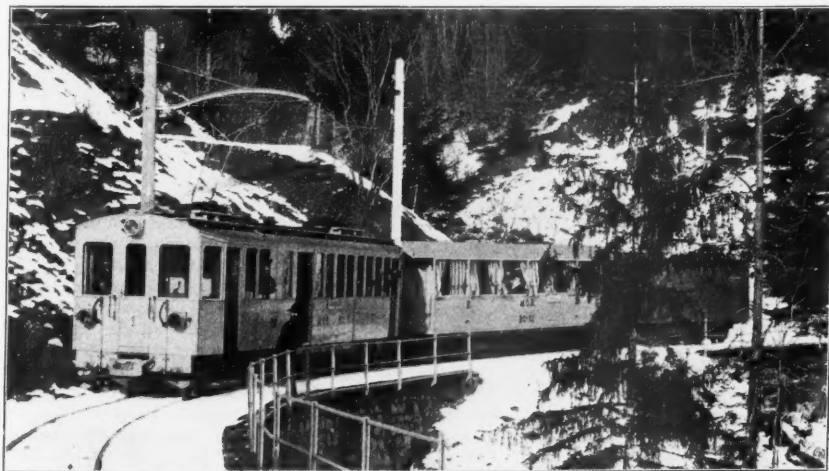
From Montreux to Les Avants the trip is made in 40 minutes; from Les Avants to Montbovon 32 minutes, and from Montbovon to Zweisimmen 1 hr. 52 min. The total time required to make the entire

trip is therefore 3 hr. 4 min.

The four sub-stations on this line are each equipped with motor generators and storage batteries having a capacity of from 520 kw. normal to 370 kw., while the overload capacity for each sub-station is much larger. The rolling stock includes 12 motor cars,

for the Montbovon sub-stations are of the four-pole type, the armatures measuring 850 mm. (33½ in.) in diameter. The conductors are wound in 120 slots. The commutator has 360 segments and a diameter of 510 mms. (20 in.). Its length is 260 mms. (10¼ in.).

An accumulator plant of 360 elements is provided having a



Motor, Passenger Trailer and Freight Trailer—Montreux Railroad.

nine trailers for passengers and 16 freight cars, with working cars and a snow-plough. Two steam locomotives have also been provided as a reserve for use in case of an emergency.

The Division Engineer in Railroad Work.*

In general, the division engineer is the engineer nearest in touch with the men—the employees. He has human nature to deal with, and needs most to be human in nature. Said Stephenson, "The most important branch of engineering is the engineering of men." The man who has men to handle need never be lonesome, and must sleep nights, and nights only. This human element, that so largely enters the province of the division engineer will prevent rust if squarely met, and will finally bring disaster if dodged. When, to theoretical engineering you add practical engineering, and to that add human engineering, you have the division engineer. And this defining sentence probably need not be restricted to railroad work only.

The theory, in fundamentals, we learn pretty well in four years in a technical school, but go on elaborating it more or less through life. The theory gets homelike. The principles are as familiar as old friends—nothing new. And we learn practical engineering in the next ten years or more, or go far toward doing so. We have precedents to follow. One bridge is, in the main, like another. One tunnel half like another, and the other half like a third. Once in a while we meet novel conditions and they are welcome milestones in our lives. We fairly grow careless through monotony, on the whole. But the engineering of the humans we meet and have to deal with keeps our blood circulating, sharpens our wits, turns our hair gray, and brings on that disease of civilization—neurasthenia (nervous prostration). The human race is not monotonous. No two are alike. Seldom is it that two even look alike; and, if one look like the other, that other will get even by acting the contrary way.

The theoretical principles of engineering are as broad as the universe; the practical principles may be followed all around the world subject to the laws of climate and of commerce; but human engineering is racial, provincial or individual. This human engineering separates the assistant engineer from the division engineer. It is the quality which bridges over the chasm between the assistant engineer and the roadmaster. As a qualification in engineering ability, it commands a higher salary than did the added qualification, which in turn made us draftsmen, instrument men, or assistant engineers. Too much stress cannot be placed on the value of the study of men when a man is an assistant engineer.

In my observation, it is the inexperienced and weak foreman who is most apt to have strikes. Since a strike may be considered the extreme of ill discipline and failure in management, we may safely say that lack of experience or of fitness on the part of those who handle men, brings on much of our labor troubles. In my observations, most labor troubles with gangs of men are not from a question of wages. Bad treatment is a more frequent cause of trouble. Most of the ill treatment comes from a want of knowledge of men on the part of some one in authority. Men very seldom become dissatisfied because worked too hard. A man who allows loafing in the gangs is never liked by the men, and will soon have trouble. Lack of knowledge of the work on the part of some one in authority causes many of our strikes. Some one somewhere thinks he knows the engineering of humans, when he is woefully ignorant of it. That causes the trouble, and the higher in authority that man is the larger the trouble, and the less willing that man is to listen to the opinion of others, before making up his own mind, the oftener the trouble will occur. Human nature is provincial. You may know the labor on one division, but if you go on another division and feel too wise to listen there, you will find a phase of human nature quite new to you, and you will early have trouble. Egotism is cured by studying human nature. If you would handle men successfully, you must keep your ear always close to the ground and your heart open to appeals from the men in kindly sympathy, and your mind open to new convictions day by day. The man who thinks he never made a mistake, the man who has things "pat," or the man who has a "system," is each unfit for authority over men. Such men, whatever their engineering ability, are not fit, and will never be fit for division engineers. They lack in human qualities.

Strikes are about as old as history, and for them there is no panacea. Anarchy is an epidemic which may break out at any time. Intelligent handling of men and sanity of mind of employees are the present nope for peace.

For the purpose of this paper we will assume that the division engineer reports directly to the chief engineer and is reported to by the assistant engineers, instrument men, rodmen and other engi-

neering assistants. The clerks of the division office report to him. The roadmasters and master carpenters with their forces, report directly to the division engineer. What duties and what attitude does this require from the division engineer? Toward the chief engineer, his superior, he must have loyalty. This means more than obedience. It is obedience of the heart as well as of the head and hands. No circumstances can justify less. Disloyalty should be as repugnant to a division engineer as informing is repulsive to an Irishman. And when the organization you chance to be with, seems to expect you to be disloyal to the man you were explicitly told to report to, you quit. You are in a crazy organization, an impossible one, and you are wasting time.

Now loyalty means honesty. Therefore, when your superior asks for your opinion, give it to him. He is entitled to it. He has asked for it. Do not give him a reflection of what you think his opinion to be, just to make yourself "solid" with him. That is not honest. If he is competent, he will see through it all. You do not help him any. It is your duty to help hold up the hands of the chief engineer. Try to do that and despise trying to curry favor. Always be respectful to a superior. Your patience will be tried to the limit, but be patient. His clerks will write you letters over his signature, which, placed before a jury of chief engineers, would consign your superior to an asylum, but a division engineer should be above "getting even" with clerks or draftsmen. In that better land to which good division engineers go, there'll be no letters written by machinery.

The division engineer must be the master of his temper at all times. He must gratefully remember that his is the highest rank surrounded by men who have been specially trained in their specific work. His superior is not so fortunate and has greater trials than a division engineer. Long suffering is not pleasant, but it is, nevertheless, a part of professional training. You do not need to have trying times with but one office now. Promotion will make you worse off, possibly, and just to relieve the strain, you see to it that your clerk or your office boy does not write advice to roadmasters, or over your name seek wisdom from bridge men. You do not need to make an endless chain of it. You have time to go and see, and advise, and inquire, and decide without writing many letters or sending many telegrams. Or, if you have not, send some one to do it for you. Correspondence is essential and unavoidable to a chief engineer. It may be largely or altogether avoided by a division engineer in dealing with subordinates, for he is dependent of necessity upon that human element of which we have spoken. In my experience, the fewer letters a division engineer can write to foremen, roadmasters and master carpenters, the better. Some of us can perhaps do more through office supervision than I am able to do, but letters can never take the place of meeting a track man or a bridge man on the work and looking it over and talking it over there. If you are not the kind of a man to do that, I think you are not just the kind of a man for a division engineer. You may be able to do better work and of a higher grade, but that particular kind of work you can never do best. The gangs want to see the "old man" around pretty often. They want him to see how tough a job they have, or how well they are doing the work, or how hot it is there, or how cold it is. They will each man work the better for it, and they will not leave to go to another division, nor strike for more pay or overtime. All troops like to see their brigade leader. He means more to them than bulletin orders or messages by courier from the general in command of all the forces. Men follow best by sight and learn to love by sight alone. That "absence makes the heart grow fonder" never applied to a pile driver gang. Is it easy and nice driving? They want you to see how fast and how well they are driving the piling. Is it hard and unhandy driving? They want you to see how hard it is to get the piling down and how difficult to get at the piling to keep them in shape at all. Maybe you can suggest something to help. Maybe you can send them a better appliance. In any case, you can share the credit, the care and the responsibility, and that alone is a help. In this connection one scarcely need say that many letters of instruction to assistant engineers and the junior engineering assistants are not in place from a division engineer. If on maintenance, have as many of them as possible work from your own office, and tell them and show them; not write to them. You are the school teacher of the engineering organization. A correspondence school is better than none, but it is not the best. Teaching by personal contact is conceded to be better. You remember best the personal qualities of your best teachers; not their system nor their syllabus. You are training younger men to be engineers and men. The closer you are to them the more you can do with them.

Organization is one of the important problems of the division engineer. On construction work this is less difficult than on maintenance, for then he practically has but two classes of labor to deal with, viz., the engineering force and the contractor's organization. That engineering force can be organized, equipped and handled quite along the lines of the regular army, but much liberalized. The army furnishes the skeleton of a good organization, but must

*From a paper read before the Western Society of Engineers by Willard Beahan, Assistant Engineer, Lake Shore & Michigan Southern.

have flesh and blood added to be used in civil life without revolt. Obedience and regard for rank we must have. Salutes are out of place, and an engineer organization needs to be a pure democracy. Toward contractors the engineer should show justice tempered with mercy. The division engineer should inculcate that idea in his assistants. An excellent chief engineer laid down this rule to a division engineer on railroad construction: "It is your duty to stand between the contractor and the company, and say what is right in equity." The general clauses of contracts give large powers to the engineer. These are to discipline bad contractors and protect the company from weak ones. They are not intended to be insisted upon always. Never make expenses for a contractor which in no way benefits the company. Make the company pay for mistakes of its own employees. Never keep a contractor waiting. Never accept better treatment from him as a division engineer than he gives a rodman. Consider, so far as you can, that all men on the right of way—engineers and contractors—are all under the division engineer, in a way, and make them each and all treat the others well. "Line up" the biggest contractors yourself whenever necessary. A division engineer on construction is boss of the right of way so long as he does not come between the contractors and his forces. He has a not difficult position from the standpoint of organization.

But, on maintenance, the division engineer has some trials with subordinates. Assistant engineers will get over into the province of master carpenters and roadmasters. Even instrumental men incline to the same fault. Time needed for checking levels and spans will be wasted "chumming" with a foreman and giving him advice. About the third year out of college we feel disposed to instruct the pile driver foreman. About the twenty-third year out of college we will be glad to let that pile driver foreman do the driving. Of course, bridge men and track men do not join well. There is by nature a neutral strip between a bridge and the track beyond, over which rolling stock is supposed to pass unguarded by either track men or bridge men. Out of which fund must this cost be met? Should track men "wait upon" bridge men and mow the lawns of agents, or is that last a transportation charge? Is a switch light rolling stock or right of way? Is working a coal shed track repairs or train expense? All these and some more are questions for a division engineer.

As a general proposition, the man to do the work is that man who can do it best for least money. Leave to others, systems of organization. Have no experiments to try yourself. Do not strain to make a record, but be content to let it follow you. From day to day assign duties to the man who can do the work cheapest and best, and leave the new ideas to theorists and the record to Providence. Divide the work along the lines of the different crafts and place the maintenance of a structure under that craftsman who can do the major part of its maintenance. Aid this craft where economical, with other or cheaper labor, but keep the responsibility undivided. It is better to have a gang of laborers in the bridge department than to call on section men to do such work for bridge men. It is better to have an axeman in an engineer party than to take a section man to drive stakes regularly. Give each man his own kind of work to do and keep him at it.

We have said that the division engineer is school teacher in his department. It is a graded school. Discourage a rodman who wants to do an instrument man's work before he is a first-rate rodman. Do not expect or allow the clerk to do things which an assistant engineer only is paid for knowing. It is not fair to expect a man to do work regularly which is beyond his grade. You are weak if you ask your clerk to be yourself when you are out on the road. You are silly when you have a pet whom you allow to do the work of a higher paid man who is there to do his own work. Observe not only rank but seniority, and if a man is not fit to keep up his own work get rid of him. Make men do the work they are paid to do or quit. Never have pets. If you dislike a man never let him know it. They are all your brother officers.

Never let an older and ranking man misuse another. Talk to him sharply and promptly. If he will not finally treat the younger engineer well, get rid of him. To be unfit for authority entirely unfits any engineer for taking charge of an engineer party. Make engineers of equal rank get on well together. Keep at it until they do. Never lose your own temper and never allow any one else in your professional service to do so without notice and remonstrance and final prevention.

Lay out field work on maintenance in trips to cover several pieces of work; each trip with least travel. When that trip is arranged, do not break into it with work that arises at the time. Anticipate work as much as you can. Let some work wait as it can until urgent work takes a party near there. This idea will save on large maintenance divisions about one hundred dollars per man per year for traveling expenses, and do more work and do it better. Never start men out so they cannot tell when they will get back. And if, as a division engineer on railroad work, you usually work the men nights or Sundays in addition to full weekdays, you do not know your business. Another man can take your engineering force and do more work for the same money and

please both the men and the chief engineer better. You are not working your head well. You do not plan well. You do not organize well. You have reduced the speed of your men—a sad fault.

Avoid divided responsibility where you can do so. If you can set apart one piece of work for one assistant engineer, have him do it and let no other man of equal rank go there. Assign work of their kind to instrument men and leave them alone responsible to you. Track and bridge men are divided by territory, and keep foreman so divided. Always be able to hold some one man logically and consistently responsible. Give him time and help to do the work. Let him follow his own devices all that you see you safely can. You see him start; visit the work with him quite often, and occasionally without him. Ask him about progress and cost just to check your own opinion from what you saw there and to keep him alive to the situation. If he gets into trouble, go out and shoulder the trouble with him, and if serious trouble, be ready to take all responsibility and be on hand for the emergency which you have foreseen or feared for some time. If he does ill, tell him quickly and prove what you say. If he does well, publish it among the men, and tell him, and write the chief engineer, commending him and citing the facts. If you cannot praise a man oftener than you blame him, let him go. And if you never praise him when he deserves it, the time will come when he is deaf to your criticism.

Never think aloud that you know as much about track as a trackman, or as much about bridges as a bridgeman. Listen to their practical opinion and leave them alone to their practical handling of their work. The company is not paying you to be a roadmaster now. If you have not more confidence in the judgment of the Superintendent of B & B who reports to you as to the fitness of a wooden stringer, than you have in your own judgment, then you are egotistical or need a new Superintendent of B & B. It is very hard for young division engineers to curb their knowledge. Just to help yourself to a more correct view, suppose you go to the chief engineer and say a certain bridge is unsafe. When he seems to hesitate to tell you what to do about it, just casually mention, in addition that the grayhaired Superintendent of B & B has also examined that bridge, and he, too, thinks it unsafe. Then observe with what alacrity and feeling of relief the chief engineer tells you to rebuild the bridge. No division engineer is sufficient unto himself. In his younger days it may be cured. In his riper years he is a hopeless failure. I respect the judgment of the roadmaster and bridge superintendent. I realize how dependent railroads are upon track and bridge foremen, and I trust that as a division engineer I will never lose my inclination to look up to them rather than to look down upon them. They know much that I have never had the time nor opportunity to learn. As engineers we can never increase our usefulness on maintenance without first having high appreciation of these foremen of maintenance gangs.

The last lesson in its order to be learned by a division engineer, is the relation of his position to that of other division officials. This relation varies with different roads. It may vary from year to year on the same road. It is unfortunate to our profession that so often we are in a transition state. It puts us in a bad light at times. It tests any organization to change front. The civil engineer is far more used on maintenance of railroads than he was a score of years ago. We are not all of us ready for the new duties and the new relations. A construction engineer is not wonted to maintenance administration. A maintenance man trained to one type of operative organization, finds it hard to adapt himself readily to a very different type when going from one road to another. Since the civil engineer is growing in favor on maintenance, he will suffer from jealousy. Prosperity breeds enmity, just as acquiring wealth brings hatred to our door. At this time, all our paths are not paths of pleasantness. As engineers we are coming to be useful if at all, just because we can put a dollar where it can earn more than where another man can put that dollar. If this is true, the corporate owners of our roads will give us the opportunity to do just that. It is not a question of type of organization—division, departmental or what not—but it is a question of administrative investment.

It is clearly the duty of the division engineer to work in perfect harmony with each and every division official so far as lies in his utmost power. Be agreeable always. Be a good mixer but no meddler. Never criticize other departments. Nobody wants to know your opinion on transportation, traffic or motive power. Only the fool knows too much—in this case. Help the other heads of departments of the division. Make your organization helpful to the whole division, and agreeable in every way. Hold up the hands of the superintendent of the division. Study to make your part of the work contribute all it can to the success of the administration of that superintendent. This is a principle holding true, whether or not you report to that superintendent.

Throughout this paper it must have been apparent that modifying conditions incident to various types of organization for individual roads could not be taken into account. The limits of a paper prevents this. General principles will apply, but there is no universal practice, and may never be. Traffic and climate and area

of a system must modify. In a general way we have assumed for the purposes of this paper an outline of one of the most common types of organization. No paper of this kind can have general applications save in principle. As division engineers, some of us report to chief engineers and some to superintendents, but the relation to our subordinates and to our work remains the same in either case, and while the gift of prophecy would be needed to say to whom the division engineer on maintenance of railroads will report in the future it now seems likely that before very long he will have charge of maintenance of way of railroads. May we be ready. Engineers, we must trust we now are; track men, we may be or soon must be, and, finally, we most imperatively must become railroad men. And the world has yet to see what may soon appear as the American railroad man.

Report of the Commissioner of Bridges of New York City.

Bridge Commissioner George E. Best's report on the bridges of the City of New York contains some very interesting data. Reference is made to about 43 bridges, ranging in cost of construction, exclusive of land, from \$1,500 to \$12,000,000 each. Naturally the greater part of the report, which, in all, contains 308 pages, is devoted to the bridges of the East river. The approximate cost and other data in regard to these is given in the following table:

Bridges Over the East River.						
No.	Name.	Water crossing.	Terminals.	Height, above high water, ft.	Type.	Approx. cost, exclusive of land.
1.	Brooklyn Bridge.....	East River.	Park Row, Manhattan; Washington St., Brooklyn	135	Suspension.	\$10,975,168
2.	Williamsburg Bridge.....	East River.	Clinton and Delancey Sts., Manhattan; Driggs and Roebling Sts., Bklyn	135	Suspension.	10,981,575
3.	Manhattan Bridge.....	East River.	Canal St. and Bowery, Manhattan; Nassau and Bridge Sts., Brooklyn ..	135	Suspension.	*12,000,000
4.	Blackwell's Island Bridge	East River.	Second Ave. and 60th St., Manhattan; Crescent and Jane Sts., Queens	135	Cantilever.	*10,000,000

*Under construction.

In referring to these bridges the Commissioner says:

The Brooklyn Bridge has been kept under constant surveillance and careful inspection, and is now in first-class condition. The number of passengers crossing it has increased so that about 36,000 passengers now cross in the bridge trains in a single rush hour at night; this means that the cars, which seat about forty people, actually carry three times that number during one rush hour, from 5.30 to 6.30 p. m. These passengers are crowded into the cars and on the station platforms in a most disgraceful manner.

In 1890 careful estimates were made of the probable future travel on the bridge, and the number of passengers now carried in the busiest hour of the day is 40 per cent. greater than the maximum capacity then believed to be practicable with the length of train and number of trains now run, and it was estimated that the number of passengers now carried would not be reached until 1920. Obviously the growth of travel has increased beyond any figure then reasonably expected and it is hardly possible that the number of passengers carried will be diminished; it must increase until the Manhattan Bridge can be completed and put in operation to relieve the pressure on this structure.

The completion of the subway, with its principal station directly in front of this bridge, will certainly increase the present intolerable conditions. Much time will be required to completely reconstruct the Manhattan terminal and build the large station now projected as a joint City Hall terminus for the Brooklyn and Manhattan bridges, but it is certain that the extension of the bridge tracks across Park Row and on the subway plaza will permit the use of a greater number of trains and the more rapid movement of these trains and nearly or quite double the platform areas and the convenience of access thereto. This construction over Park Row would be temporary, pending the completion of the large station, and should be commenced at once and completed if possible before the heavy travel of the summer begins. There is no good reason for delaying this work, the plans for which have now been changed so as to avoid trespassing on the grass plots of the City Hall Park; failing to secure this measure of relief the conditions at the Manhattan terminal must grow steadily worse, and they are now so bad as to seem unbearable.

The extension over Park Row must be temporary in any event, for the larger station cannot be operated without its removal, and the necessity for its existence will disappear, at latest, with the completion and full use of the Manhattan Bridge. This extension will not be more unsightly than the present terminal, and the relief which it is certain to give would seem to justify fully the temporary continuance of an unsightly structure at this point. Unfortunately the few interests which oppose its construction are those which never or rarely ever use the bridge, and have thus far outweighed the interests, convenience, comfort and even safety of the millions who must use the bridge. The Williamsburg Bridge was opened to public travel on the 19th of December, 1903, one roadway then only being available for use.

On November 3, 1904, the Brooklyn Heights Company, the Coney Island Company and the Bridge Operating Company started the operation of trolley cars on the south tracks of the bridge.

Owing to the fact that the ground designated as a plaza on the Manhattan side of the Williamsburg Bridge had been given over to street purposes, it was not available for this Department. Adequate facilities for car service cannot be constructed on the Manhattan side, and the cars commenced operating and are operated on a very meagre and inadequate terminal. But, notwithstanding the condition of this terminal, more than 1,000 round trips per day have since been made by the trolley cars on the south tracks of the bridge, and something like 30,000 passengers per day are carried in these cars.

It is of the utmost importance that the ground designated as a plaza on the original maps of the bridge should be restored to the control of this department, in order that something like adequate accommodation may be afforded the cars and passengers at the Manhattan end of the bridge.

The travel on the roadways of the bridge has fully equaled the anticipations, and the receipts per month now aggregate about \$5,000, against \$6,000 on the Brooklyn Bridge. The Manhattan Bridge, in all probability, will be the most efficient of any of the large bridges now authorized over the East river. It is provided with a middle roadway, 35 ft. wide, and with eight railroad tracks, four for trolley cars and four for elevated railroad trains.

This bridge, with the Flatbush avenue (Brooklyn) extension,

will form a wide avenue, virtually from Prospect Park (Brooklyn) to the junction of Canal street and the Bowery (New York), which may be continued through the wide avenue of Canal street to the North river. The bridge will form an important link, therefore, in a wide highway from the ocean to the North river through the central portion of the city.

The preparation of the plans for this bridge was first authorized on November 30, 1898. Early in 1902 the plans for the superstructure of a wire cable suspension bridge had been developed, and had these plans been adhered to contracts might have been let for this type of bridge before the close of the year 1902. It was, however, determined to change these plans and prepare plans for an eye-bar cable bridge, using nickel steel for the eye-bars.

Calculations show that there would be 10,000 tons more steel in the eye-bar type of bridge for this location than will be required for the wire cable construction, and notwithstanding the fact that statements diametrically opposed to this are made, I am convinced that the wire cable suspension bridge can be built in one-half the time, and at very much less cost, than the eye-bar bridge.

In the preparation of the plans for the eye-bar bridge none of the essential details were worked out on a practical basis, and while a contract could have been let on the plans prepared, it is certain that more than a year's time would have been required for the contractor to determine the details of construction before any work could be done.

The City of New York already owns two wire cable suspension bridges, both of them of spans exceeding that for the Manhattan Bridge by nearly 150 ft. The valuable work that these bridges have done, the ease and facility with which these bridges were constructed, the certainty of knowing within a reasonable time when the bridge would be completed and with close proximation what it would cost, the knowledge that the wire cable bridge would make a satisfactory bridge, and the experimental nature of the eye-bar bridge and the uncertainty as to its action under the traffic imposed, led me to reject the plans for this bridge, especially as I believed that they had not been legally approved by the City authorities, and to substitute therefor the wire cable bridge, which was anticipated in the original authorization, and which I believed would give the safest bridge at the least cost and in the least time.

The plans for the wire cable bridge were approved by the Art Commission in September last, and the preparation of detailed plans was at once commenced.

The methods of construction of this type of bridge are not in the least experimental, they are well understood and familiar to us all, and I believe that there is no good reason why the bridge on this plan should not be completed and opened for traffic early in the year 1908, while there is no experience to found an opinion on and no good reason to believe that the eye-bar bridge could be completed before the year 1910.

The Manhattan Bridge as designed will, I believe, be one of the handsomest bridges that has ever been built in the world, and I

believe that it will be built at less cost and in less time than any other structure of corresponding magnitude.

The wildest vagaries of vigorous imaginations and concentrated prejudices have led the uninformed to entertain and utter malevolent and iniquitous statements as to the motives for changing the plans for this bridge. These expressions, however, have not deterred me from the performance of what I believed to be the clear, clean duty of building this bridge on a recognized type of construction and removing it as far as possible from the realm of untried experiment.

The work on the erection of the steel superstructure of the Blackwell's Island Bridge has commenced and will reach an advanced stage during the coming year. More land must be taken on the Manhattan side to provide for terminals at that point, and these terminals must be studied with great care. On the Queens side we should have more width of land for the approaches, and although not now perhaps directly within the jurisdiction of this department, provision should be made for carrying a viaduct,

bridges over the river can never be very large, the excessive cost and the vast areas of real estate taken from private utilities and from the assessment rolls dictate that the number of such bridges shall not be excessive. Tunnels can be built quicker and cheaper than bridges and are the normal agencies for the passage of subways across the river. We cannot, however, put our highways in tunnels, and the great bridges should be used to their maximum capacity for highway purposes. They should provide for the safe and expeditious transit of vehicles and of surface cars. More people traveled in surface cars in New York City last year than in the elevated railroad cars, and even with the multiplication of subways the surface cars must still be used, certainly for many years, for transit over the East river, and these cars can be run most easily and most conveniently over the bridges. The discharge of passengers from the surface cars at the termini of the bridges is quite as objectionable as from the elevated railways, and careful consideration should be given to a wise distribution and collection of all railroad passengers over the bridges. The Boston Subway was built exclusively for the use of surface cars, and the old Hudson River Tunnel is being completed for the same service. There is no valid reason why the surface cars over all the bridges from Brooklyn and Queens should not pass into subways in Manhattan and thus secure a wider, safer and more expeditious distribution and collection of passengers for the surface cars.

The basement of the Centre Street Station could be used for an intermediate collecting and distributing station for Brooklyn surface cars, safer and more convenient than the present loop terminal; and an underground station could be easily built at the

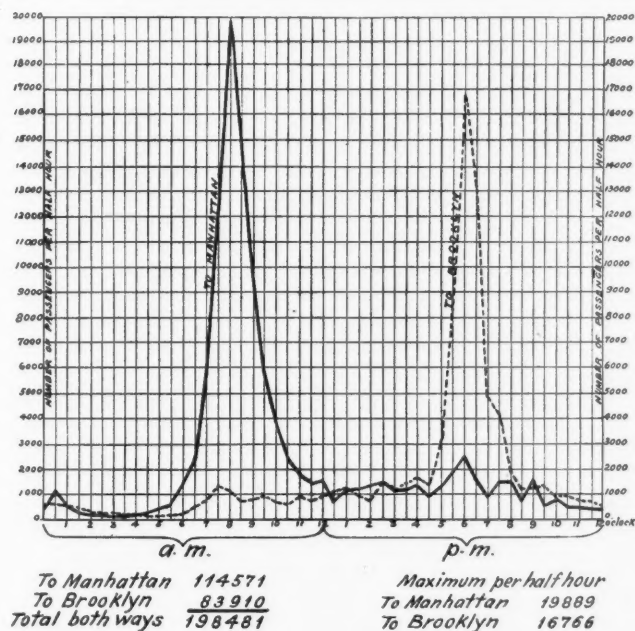


Diagram Showing Passenger Travel by Half Hours on the Bridge Railway.

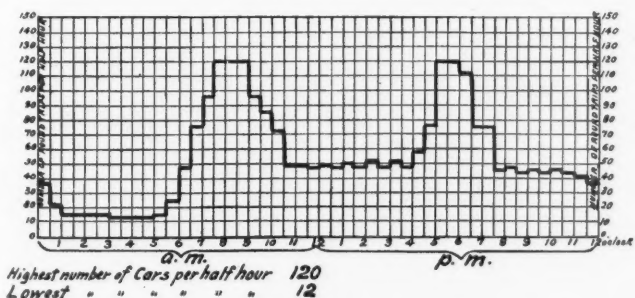


Diagram Showing Bridge Railway Car Service Round Trips by Half Hours.

preferably as an approach to this bridge, across the low ground of Jackson avenue and the extensive railroad yard which the Pennsylvania Railroad is building at this point. This is a matter of the very greatest importance, not especially to Long Island City, but to millions of people who must eventually reside in the Borough of Queens, between Long Island City and the easterly boundaries of the borough.

Realizing that bridges of this character cost immense sums of money, and are not likely to be easily duplicated, and in view of the fact that the large bridges should be given the greatest capacity possible, I have thought it advisable, at a slight increase only in cost, to recommend the construction of this bridge so as to provide for the addition of two elevated railroad tracks in the future, in case it should be deemed necessary to build them.

The studies of the Department of Bridges and of the Rapid Transit Commission as to connections for or with the bridges over the East river have been devoted almost exclusively to elevated or train service. It should be remembered that the number of great

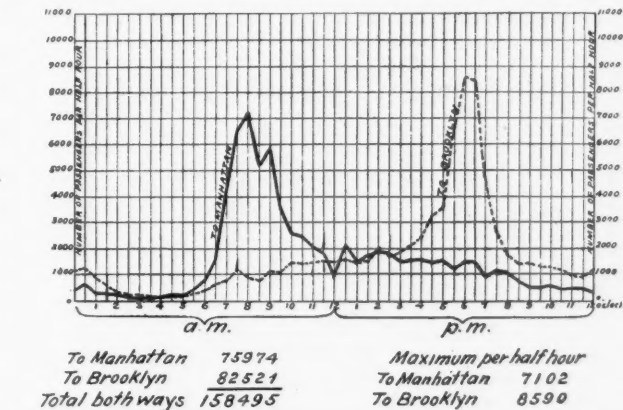


Diagram Showing Passenger Travel by Half Hours in Trolley Cars.

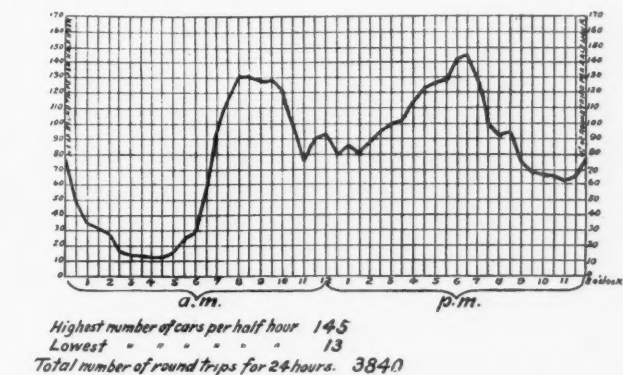


Diagram Showing Trolley Car Service Round Trips by Half Hours.

Manhattan terminal of the Williamsburg Bridge which would conveniently accommodate and shelter the passengers from the surface cars and at the same time provide for the extension of the surface lines across or up or down town in Manhattan, as is now proposed for the surface cars through the old Hudson River Terminal from Jersey City.

The concentration upon the Brooklyn Bridge of most of the passenger travel between the boroughs of Manhattan and Brooklyn has developed abnormal traffic conditions that, in the rush hours tax every means of travel; and whenever the slightest opportunity is afforded or facilities provided the volume of traffic rapidly expands to the limit. When through surface car and elevated railroad train service was established upon the Bridge in the year 1898 the detail passenger travel rapidly increased to more than double that of the previous year. The increase was due, to a large extent, to the stipulation in the leases that the railroad companies must include passage over the Bridge as a portion of a continuous route on which a single fare is charged. A count made November 10,

1897, when the Bridge railway (then the only means of transportation upon the Bridge) was operated by the Trustees of the New York and Brooklyn Bridge, showed a total of 144,509 passengers carried in twenty-four hours. A similar count made by the Brooklyn Heights Railroad Company in October 17, 1901, showed a total of 356,976 passengers carried on Bridge railroad and in surface cars.

When the counts were made by the Brooklyn Heights Railroad Company, in 1904, employees of the Department of Bridges also made a record of the people that crossed the Bridge on the promenade and in vehicles. The following table shows the total number of people and direction of travel on the Bridge railway, in surface cars and vehicles and on the promenade, October 17, 1904:

	To Manhat- tan.	To Brook- lyn.	Total.
Passengers:			
In surface cars	75,974	82,521	158,495
Elev. R.R., on bridge cars or on through trains	100,798	71,998	172,796
Local Bridge	13,773	11,912	25,685
Totals	190,545	166,431	356,976
Foot passengers on promenade	9,207	5,278	14,485
People in vehicles	1,773	1,541	3,314
Grand totals	201,525	173,250	374,775

The train service on the Bridge railroad in the morning from 6 a. m. to 10 a. m., and in the evening from 4 p. m. to 7 p. m. each week-day, consists of four-car Bridge trains, hauled across by cable and switched from the incoming to the outgoing platforms by electric power. At all other hours of the day and night, and on Sundays, the train service consists entirely of through elevated railroad trains, operated over the Bridge by electric power, from ten different lines of the Brooklyn Rapid Transit system. Local passengers are carried from Manhattan in the rear car of all trains that load at the westerly platforms. The majority of the passengers that cross the Bridge each weekday on the Bridge railroad are carried in Bridge cars, transferring to or from elevated railway trains at the Brooklyn terminal. The average weekday passenger travel, determined by several counts made during the months of October, November and December of the year 1904, is about 108,400 passengers carried from Brooklyn to Manhattan; of this number about 78,700, or 72.5 per cent., are carried in Bridge cars; and of about 92,200 passengers carried from Manhattan to Brooklyn, about 67,800, or 73.5 per cent., are carried in the Bridge cars. In two hours, between 7 a. m. and 9 a. m. of each weekday, 52,000 passengers, or about 48 per cent. of the daily average, are carried from Brooklyn to Manhattan in Bridge cars; and in one and one-half hours, from 5 p. m. to 6.30 p. m., about 48,000 passengers, or about 52 per cent. of the daily average, are carried from Manhattan to Brooklyn.

In the evening rush hours four-car Bridge trains are run at intervals averaging about one minute, or at the rate of 240 cars per hour; during the busiest hours the elevated railroad train service on all lines to the Bridge terminal consists of 79 trains, or about 400 cars per hour.

The diagrams which follow show the number by half hours of passengers in trolley and bridge cars in a day of 24 hours. Also the number by half hours of cars operated. A study of these diagrams will give some idea of the enormous amount of traffic which has to be cared for during the rush hours.

Record of the "Scott Special" of the Santa Fe.

The transportation department of the Atchison, Topeka & Santa Fe has compiled a record of the run of the "Scott Special," which made the record-breaking run from Los Angeles to Chicago on the 9th, 10th and 11th of July last. The train consisted of a baggage car, a diner and a sleeper, the total weight of the three being 338 tons. The elapsed time was 44 hrs. 54 mins., and the total distance 2,246 miles, so that the average rate was 50 m.p.h. The delays amounted to 137 mins., making the actual running time 42 hrs. 37 mins., and the average rate of speed 52.7 m.p.h.

The train left Los Angeles at 1 o'clock p.m., Pacific time, and made the run over the Los Angeles division of 141.1 miles in 175 minutes, 12 of which were lost in delays. From San Bernardino to Summit, 25 miles, a helper engine was used, the adverse grade being 158 ft. per mile part of the way and 116 ft. the rest. The average speed over the division was 48.3 m.p.h. The Arizona division, 318 miles, was covered in 411 minutes, 20 minutes of which is accounted for by delays. The average speed was 46.4 m.p.h. The fastest time was between Newberry and Lavic, 23.2 miles in 35 mins., which was down grade part of the way and against a 53-ft. grade the remainder; also between Goffs and Ibis, 16.9 miles in 16 mins., which was practically all down grade, with some 21 ft. adverse grades. At Needles a change of engines was made in the remarkably short time of one minute.

The Albuquerque division of 429 miles was covered at the rate of 44.5 m.p.h. The larger part of this was mountain climbing, with ruling grades of 95 ft. per mile. On the New Mexico division, Albuquerque to La Junta, 348 miles, the average speed was 45.8 m.p.h. On this division is the famous Raton Pass, the elevation of the summit being 7,608 ft. The heaviest grades were 175 ft.

per mile. From Summit to La Junta, about 100 miles, the descent is rapid, the elevation of La Junta being 4,045 ft. A hot box on the dining car caused delays amounting to 12 minutes on this division. Up to this point the locomotives had been ten-wheel, Prairie and Pacific types. From La Junta to Chicago four-cylinder balanced compounds were used on every division, with one exception. The next division, the Western, 355 miles, was covered at the rate of 60 m.p.h., the delays amounting to 30 minutes. Near Kent, Kan., the balanced compound drawing the train broke a side rod and knocked out a cylinder head. Train No. 8 was passed at Kent and its engine, a Prairie type, taken to Newton. The fastest time was made between Deerfield and Sherlock, 8.1 miles, which is recorded as having been traversed in 6 mins., or at the rate of 81 m.p.h.; between Spearville and Offerle, 11.4 miles, the time is given as 8 mins., or at 85.5 m.p.h.

The Middle division, from Newton to Emporia, Kan., is only 73.1 miles long, and it was traversed without a stop in 70 mins., or at the rate of 62.6 m.p.h. The Eastern division to Argentine, 124 miles, required 130 mins., but 15 mins. of this was lost on account of slow orders over bridges being repaired, and through yards. Lake View to Lawrence, 7.5 miles, was covered at the rate of 75 m.p.h. From Kansas City to Ft. Madison, Iowa, the Missouri division, the average speed was 53.04 m.p.h. for the 221 miles. There were no delays except to change engines. One mile between Norborne and Carrollton, Mo., is recorded as having been made in 40 secs., or at the rate of 90 m.p.h. The fastest long run in the whole journey was made on the last division, the Illinois. The distance was 236.8 miles, which was covered in 238 mins., or at a rate of 59.7 m.p.h. On this division, the 2.8 miles from Cameron to Surrey is recorded as having been made in 1 min. 35 secs., or at the rate of 106.1 m.p.h.

Railroad Shop Tools.

(Continued.)

MILLING MACHINES.

Milling machines have been in use for many years in manufacturing plants. At first they were used for making small machine parts, such as parts for firearms, sewing machines, clocks, etc. Their ability to do this class of work accurately and rapidly suggested to the machine tool makers that a wider field of work was open to this type of machine. Larger and more powerful designs of milling machines were then made and were principally used for

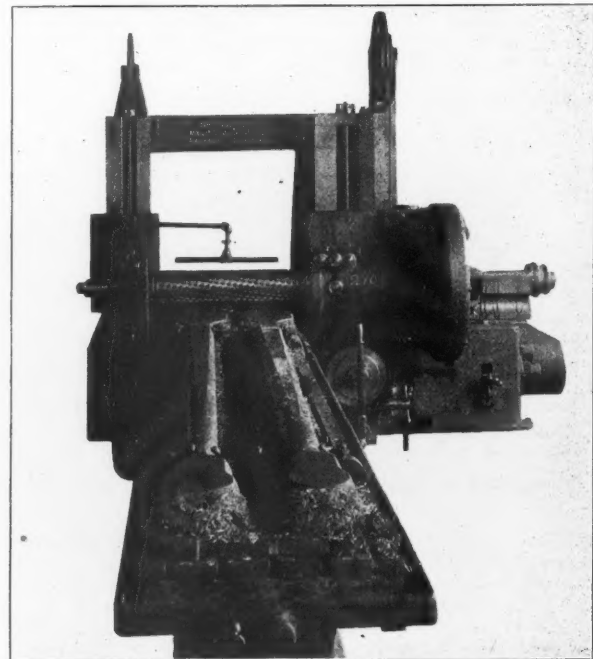


Fig. 1—The Ingersoll 36-in. x 16-ft. Milling Machine.

tool room work and for the heavier parts of small machines. The first use to which this type of machine was put in railroad shops was in the tool room, but gradually the machine tool makers increased the sizes, until to-day the milling machine forms a most important factor in the equipment of all large machine shops where heavy work is done. For the past few years the milling machine has rapidly increased in popularity among railroad shop men and now many machine tool makers are making milling machines especially designed for locomotive work. These machines are made

in many different designs, including universal milling machines, vertical milling machines, horizontal milling machines, plain milling machines, etc. The principal uses to which they are put in locomotive and railroad repair shops are for milling side-rods, driving boxes, truck boxes, motion work, etc. In many cases they are a far superior tool for this class of work than is the planer. By using specially formed tools and gang-cutters in connection with milling machines remarkable results can be attained in but a very short time as compared to the time it would take to do the same work on almost any other type of machine. The accompanying illustrations show some heavy milling machines which are particularly 2 and 3 are made by the Ingersoll Milling Machine Co., Rockford, Ill. Fig. 1 is a 36-in. x 16-ft. heavy type horizontal spindle

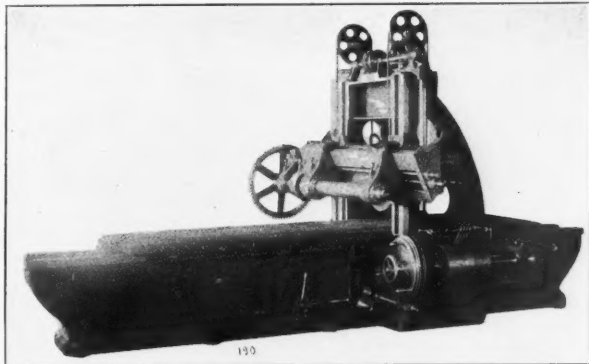


Fig. 2—The Ingersoll 24-in. Standard Type of Horizontal Milling Machine.

machine, which is used for milling side-rods and for miscellaneous work. The main housing is 27 in. wide on the face and 48 in. deep. The driving gear is 36 in. in diameter with a 4 in. face and a 2 in. pitch. The table has a working surface 36 in. wide by 16 ft. between the pockets, and is provided with a positive feed in both directions. All driving gears are contained in a gear box on the right-hand side of the machine. The horizontal head has a vertical feed on the housing, and the left-hand housing can be removed as well as can the top brace. By removing the above parts the machine can be used for milling the ends of very long pieces. The illustration shows this machine fitted with a 36-in. slabbing cutter cutting steel side-rod forgings. The surface of the forgings is approximately 20 in. wide; the depth of cut is $\frac{3}{8}$ in., and the feed is $3\frac{1}{2}$ in. per minute. This machine is driven by a

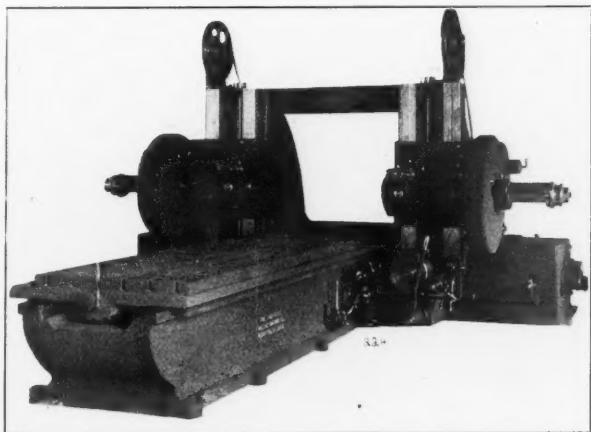


Fig. 3—The Ingersoll 50-in. Heavy Type of Duplex Milling Machine.

24 h.p. motor. Fig. 2 shows a 24 in. standard horizontal type of milling machine. For light general repair work this is a very useful machine. The table is 24 in. wide by 12 ft. between the pockets. It has positive feed in either direction and the cross rail is counterbalanced and can be raised or lowered by both hand and power. When motor driven it requires a $7\frac{1}{2}$ h.p. motor. Fig. 3 shows a 50 in. heavy type duplex horizontal spindle machine. This machine is very powerful and will take extremely heavy cuts. It is especially adapted for milling driving boxes and truck boxes and for taking heavy cuts on side-rods. The table is 48 in. wide by 16 ft. between the pockets, and like the other two machines is provided with positive feed in either direction. The spindles are of large diameter and the spindle gears and driving gears are of steel throughout. The gear changes are made in the gear box,

which is shown on the right-hand side of the machine. In paneling side rods two rods can be put on the machine side by side and independent cutters can be fitted on the shank arbors in each head. Each head has an automatic down feed, so that the sinking-in cut for paneling the rods can be taken and when the proper depth of cut is obtained the table feed can be started up without losing any time. This machine is fitted when motor driven with a 50 h.p. motor and two main side-rods can be paneled to the full depth of cut at one time with a very fast feed.

(To be continued.)

Passenger Coach Yards.*

Professor Oder and Dr. Blum have compiled in pamphlet form the result of their studies, directed especially to German and American practice, in the design and arrangement of yards for facilitating the care of passenger coaches, and the making up of passenger trains. The pamphlet is illustrated with a number of diagrams, but these are scarcely important enough for reproduction, in their relation to American practice.

Passenger coach yards serve for the reception of incoming trains as well as for the execution of all work necessary before starting new trains, and, as a rule, such yards are required at places where passenger trains have to be made up, that is, in large cities and at terminal stations. The make up of passenger trains is complicated by the necessity of arranging mail, baggage, sleeping and dining cars, etc., in a certain inflexible order. One of the safety precautions most commonly applied, is to have an empty car between the engine and the first passenger coach. In many cases the luggage car or the mail car is used as a protecting car. Furthermore, for express trains, only new or very well kept cars can be used, and care must be taken that the heavier cars are in front and the lighter cars in the rear of the train.

In loading and unloading, passenger traffic, which takes care of itself, has a great advantage over freight traffic, but in train despatching the reverse is true, because freight cars can be loaded before the train is made up, while passenger trains have to be ready to start before they receive their passengers. But passenger trains have a much more uniform composition than freight trains, and German practice classifies the cars in each train as follows:

1. Trunk, or through cars (Stammwagen) which continue in the train during its entire run.
2. Course, or set-out cars, which run only a portion of the distance.
3. Auxiliary cars, which are used to supplement either of the other kinds.

A large number of trains, especially in local and suburban runs, are ready again for service almost immediately after arrival, requiring no changes at all, or only insignificant ones, and these make no use of the yard. This is also true of a considerable number of through express trains, where the arrangement of cars can remain undisturbed, except that in German practice the protection car behind the engine must always be changed; but at terminal stations it is frequently necessary to make such changes in a train that a make-up yard proves very convenient, although a loop or a Y track often suffices to bring the train into the proper shape. The problem of making up a new train from cars taken from several other trains, constantly recurring in freight practice, is comparatively seldom found in passenger service, although passenger trains frequently require the addition of cars to provide for heavier traffic, and mail, express and dining cars have often to be changed. All special trains must, however, be made up new, and regular trains are often altered when extras or additional sections are used to carry a heavy fluctuating traffic.

When passenger trains have been emptied of travelers and drawn either by the road engine or by a switch engine into the make-up yard, mail and express cars must be separated from the others and taken to the place provided for them. Then the remaining cars must be arranged in the way in which they are to go out with the next train, and they must be cleaned, charged with gas and provided with the necessary appliances. To facilitate this work each make-up yard should have the following tracks and arrangements:

- (1.) Ladder tracks to provide for trains leaving the station platform for the yard and arriving from the yard.
- (2.) Classification tracks for separating and re-making trains.
- (3.) Car-sheds with the necessary tracks to reach them.
- (4.) Make-up tracks for "trains de luxe" and for dining and sleeping cars.
- (5.) Storage tracks to provide ordinary coaches for fluctuating traffic.
- (6.) Tracks for the storage of set-out and additional cars.
- (7.) Switch tracks for the exchange of cars with the freight yard.

The designer of a passenger coach yard must aim to obtain the

*Abstellbahnhöfe (Betriebsbahnhöfe für den Personenverkehr.) von M. Oder, Professor an der Königl. Techn. Hochschule zu Danzig und Dr.-Ing. O. Blum, Regierungs-Baumeister in Berlin. Wilhelm Ernst & Sohn, Berlin, 1904.

highest efficiency without diminishing safety; specifically, he must provide for ready enlargement in the case of increased traffic, and study out the best possible arrangement of the connections between the yard and the station platform. At large stations this connection requires several tracks and it is often a source of trouble, especially where there is dense traffic, to have the main tracks serve as part of the communication between the yard and the station platforms, although this is in many cases unavoidable. It is essential not only that all parts of a yard be so built as to avoid superfluous movements, but also that they be arranged in such a way that no operation is likely to disturb another one. If several switch engines have to work in one yard, independent groups of tracks should be provided for each one.

So far as design is concerned, it cannot be too strongly emphasized that a uniform and coherent arrangement is more important for a coach yard than for other yards or stations. It is not sufficient to reserve a certain space against the contingency of future enlargement, but this enlargement should be designed and provided for when the yard is first built. In case a yard is not sufficient for the traffic, it is generally not desirable to add further groups of tracks in order to increase its efficiency, but it will probably be better in most cases to change the whole track arrangement. In determining the number and total length of the tracks in a coach yard it is best to make an imaginary schedule containing the maximum number of trains to be handled at a given station. In no case should it be attempted to reduce the length of yard tracks and build larger platform tracks instead, for platform tracks are always more expensive than yard tracks, and require more space, as the platform must be considered and a certain number of safety devices and constructional arrangements will be necessary, which are apt to cost much more than those of a yard. Moreover, every platform track renders the whole plant more complicated and necessitates, especially at terminal stations, an increase in size of the station building. Furthermore, cleanliness and the general condition of the air are greatly impaired if trains have to be cleaned and provided with gas within the station building.

Coach tracks are generally united in a bundle, as this makes supervision easier, and the pipings for gas, steam (for preliminary heating), compressed air and water can be shorter.

The so-called classification tracks have in Germany generally a total length of at least 275 yards, while the length of each yard track is at least 44 yards. As it can happen very easily that cars have to be turned round, a turntable has to be provided for, which, in most cases, will suitably be located in the vicinity of the classification tracks. In America a turntable is regarded indispensable in case there is no Y track. Car sheds serve for the protection of the more expensive rolling stock against deterioration by climatic influences when out of commission.

Make-up tracks for Pullman, dining and sleeping cars are desirable, because these trains and cars require special treatment and have therefore to be so placed as not to be affected by the switching of the other cars, in order to facilitate loading provisions, ice, laundry, etc., by persons not employed by the railroad company. It is advisable to build these tracks at a place where they may easily be reached from outside the station. A much larger space is required for storage tracks for those cars which are not in commission during the time of slack service, because a considerably greater number of passenger coaches, mail and express cars are attached to a station than are regularly used. Generally speaking, storage tracks for set-out and additional cars have to be near the station platforms, as the latter class especially is often added to the train at the last moment.

Switch tracks serve for the exchange of cars between the station and freight yard on one side and the switching station on the other side. The latter is especially important at large stations, and includes:

- (1.) Extra passenger coaches which have been used on scheduled trains and brought back to their home station in freight trains.
- (2.) Passenger coaches which have been used for making up special trains and which cannot be brought back together to the home station.
- (3.) Freight cars for express, animal or mail transport.
- (4.) Freight cars carrying supplies for yard or station, as for instance coal, oil, etc.
- (5.) Freight cars for private tracks which are only accessible from yard or station.
- (6.) Passenger coaches which go to or come from the repair shop, in case there is no immediate communication between make-up yard and repair shop.

The administration of the German postal service has the right of adding one mail car to every scheduled train, and passenger trains are, of course, mostly used for this purpose, but as loading and unloading of mail often delays the trains considerably, and mail cars are liable to increase the weight of these trains, there has been a tendency to forward mail in special postal trains. But this practice has not yet been adopted generally. At most stations, mail is put into the car or taken out of it directly on the station platform, but at those stations where mail cars have to be added to or

taken away from a train, this is not the case. All mail is arranged in a definite and very exact order in these cars, and, as such treatment requires much time, it cannot be done during the short space of time which a train remains at the station platform; for this reason special tracks for mail cars have to be provided for at many stations. Express goods have so far mostly been forwarded by passenger trains in Germany, but as this often necessitates delay an attempt has been made to provide special trains carrying express goods whenever this has been justified by the amount of business. In North America conditions are entirely different, because the express traffic is handled by express companies and not by the postal service.

It is very desirable that roundhouses should have direct communication with the station platforms, but if this cannot be arranged, special care ought to be taken that roundhouses do not interfere with the make-up yard or divide it into several parts, as this would make subsequent enlargement difficult. Coach yards require various kinds of special equipment, such as water stations, compressed air appliances, etc. These should be placed between the tracks so as to be readily accessible on both sides.

At a terminal station used by only one line, undoubtedly the best arrangement, as far as management goes, is to have the make-up yard placed between the main passenger tracks. From the constructor's point of view such a design might give great difficulties. For instance, the expansion of the yard under these circumstances is nearly impossible; moreover, there are corners of little utility, and in many cases it is difficult to reach the mail and express tracks from outside. Generally speaking, it is best to have the freight yard and the make-up yard at the same side of the main tracks, as the traffic between these two can thus be handled very easily and without crossing the main tracks.

If several lines come to an end at a terminal station, as for instance at the Broad Street Station in West Philadelphia, many trains will leave the station without undergoing material changes. A rather complicated station of this kind is the new station at Altona, near Hamburg, where there is a considerable interurban, suburban and long distance traffic. The outer platforms of those reserved for the long distance traffic serve specially to accommodate trains which are passing through, while the inner platforms are provided for trains beginning or ending their run at Altona. This arrangement has been chosen as it diminishes the interference of incoming and outgoing trains with each other and offers the greatest safety for all movements to and from the make-up yard.

Terminal stations have certain obvious disadvantages which are known to every railroad man. One of the best ways of avoiding these disadvantages—a device which is used very often and was known in the earliest days of railroad practice, is to arrange the tracks in form of a loop. This is very practicable for interurban and suburban trains, but for long distance trains, a loop has generally to be so wide that difficulties of another character will arise, such as scarcity of space, high cost of ground, etc. It is sometimes impossible, especially in large cities, to avoid terminal stations, but this should always be done at stations with through traffic, even if there are many trains which start from or begin at this station, by providing for a conveniently located coach yard.

Foreign Railroad Notes.

The insufficiency of the rolling stock of the Russian railroads is so great that it is said that the government contemplates giving permission to order cars and locomotives from foreign works.

The Austrian tax on railroad tickets, which went into effect Jan. 1, 1903, yielded the government in that year \$3,324,019 at an expense of \$41—the cost of collecting falling on the railroads.

The highest salary paid to any officer of the Swiss State Railroads is \$3,000. No such salaries were paid in the Swiss service until recently; and it is only this year that the chief justice of the Supreme Court had his salary raised from \$2,400 to \$2,800.

An electric railroad from Lake Geneva at Montreux across mountains to the Bernese Oberland, connecting with Interlaken, a distance of 37 miles, was opened in the first week of July. This is the longest electric railroad in Switzerland, and for scenery must be one of the most remarkable in the world. It has grades as steep as 348 ft. per mile, all on the six miles of the road nearest Lake Geneva. It is worked with motors developing 80 h.p. with a tension of 750 volts. (See also page 228.)

The Italian government maintains an inspection of the corporation railroads of the country, which have now about 3,500 miles of road. Since it took over its own roads, it has reduced the number of inspection offices to 10. Besides overseeing the operation of the private railroads, these offices examine and report upon requests for charters for new lines, conduct negotiations for the acquirement of lines by the state, control the expenditures for new constructions by the state, etc.

GENERAL NEWS SECTION

NOTES.

The Long Island Railroad Company has bought 17 acres of land near Wading River, on the north side of the island, and intends to establish a model farm for the instruction of landowners in that vicinity.

The Ottawa (Ontario) Electric Street Railroad Company has just given out \$1,000 in bonuses to its employees. To men who have received no demerit marks for a year a bonus of \$10 is given and those who are charged with only five marks receive a bonus of \$5. About 30 per cent. of the men received bonuses.

The Interstate Commerce Commission has rendered an opinion in the case of the Rock Hill Buggy Co., against the Southern and the Seaboard Air Line, holding defendants' rate of \$1.30 per 100 lbs. on buggies, c.l., from Rock Hill, S. C., to Tallahassee, Fla., is not shown to be unreasonable; and under the construction placed on Section 4, by the Supreme Court, competition by the Atlantic Coast Line justifies defendants' lower rate of \$1.10 for the longer distance to Quincy, Florida.

The Interstate Commerce Commission has rendered a decision on Rates on Corn and Corn Products from Missouri River points to points in Texas. Up to February 19, 1905, the rate on corn meal was 3 cents per 100 lbs. higher than the rate on corn. On that date, the differential against corn meal was advanced so that it varied from 7 to 9½ cents. On April 15, it was reduced to 5 cents. The differential for hominy, grits and bran remains at 3 cents. The Commission holds that the differential on corn meal should not be more than 3 cents above the rate on corn.

"The Oriental Limited" is to be the name of the best through train on the Great Northern Railway after the completion of about fifty new cars which are now being built and which will exemplify the top notch of elegance and convenience. Whether or not there are to be more trains than at present, or whether speed is to be increased, are points on which the advertising agent leaves the reader in a state of uncertainty. But about the oriental feature of the enterprise there is no mistake. The porters and waiters will be Japanese, instead of negroes, and in the dining cars a specialty will be made of Japanese cooking. This improvement is said to be the result of the "conversion" of President Hill from a former state of benighted indifference to the interests of the passenger department.

A Traveling Master Mechanic.

Mr. B. A. Worthington, First Vice-President of the Wheeling & Lake Erie, the Wabash Pittsburg Terminal and the West Side Belt, has issued a circular announcing the appointment of M. E. Wells as Traveling Master Mechanic of these roads. Mr. Wells' duties are defined as follows:

"For the present Mr. Wells will have general supervision of roundhouse service, the care of locomotive boilers on the road and at terminals, the character of the water supply, etc. He goes out not to find fault or criticise, but to assist all concerned in getting better results."

Signaling.

The block system is to be extended on the Erie & Ashtabula division of the Pennsylvania, requiring 20 new signal towers and 40 additional signalmen.

Interlocking signals are to be erected at the crossing of the Chicago, Indianapolis & Louisville; the Cleveland, Cincinnati, Chicago & St. Louis, and the Pennsylvania Lines in the southeastern part of Crawfordsville, Ind. The *Crawfordsville Journal* says that this improvement follows 15 years of discussion of the question.

Uses of the Printing Press.

There is one railroad manager in Indiana who believes in obedience to the law. It is William S. Fleming, receiver of the Cincinnati, Bluffton & Chicago, Smith Bracey's memorial railroad, which connects Portland with the other end of the universe, 29 miles away. When the State Railroad Commission demanded of Receiver Fleming that he submit a complete list of the passes issued by the road to various persons, Superintendent Curtis was promptly allowed two weeks off duty to prepare the list. . . . And it is not the receiver's fault that there are so many passes out. It seems that about the biggest job of printing the old Cincinnati, Bluffton & Chicago ever had was the printing of these passes. They came in good place many times when Smith Bracey's smile failed to hypnotize the landowner whose right of way was wanted, or when the anxious liveryman was hungry for the payment of a bill. It was all done in the days when the railroad was being built. As some will remember, the company was somewhat shy of ready cash

and other means had to be resorted to at times in order to get the public to "ease up" on the officers and promoters of the road. The liveryman or the landlord hesitated to present a statement for thirty days after receiving one of these passes, and time was all that the Bracey crowd was asking. There was method in everything that was done, and there was nothing so cheap that yielded the same returns as passes.

In the list are attorneys, officers—county, state and township—and the consideration is set out whenever Superintendent Curtis was able to ascertain the excuse.—*Muncie Press*.

The "Bedbug" Special.

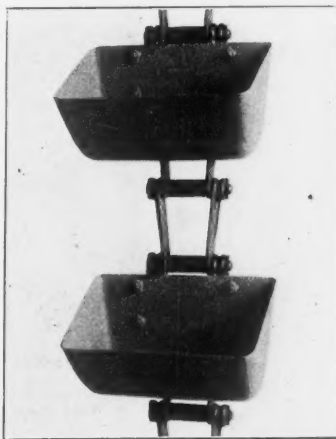
An extra train, called the "Bedbug Special," has just been sent out by the Union Pacific to exterminate bedbugs and other vermin in the section houses along the road. It is equipped with steam hose, poisons and disinfectants. Steam from the engine will be used.—*Press despatch from Cheyenne*.

Wearing Glasses on Engines.

At the meeting of the American Academy of Ophthalmology and Otolaryngology to be held at Lenox Hotel, Buffalo, September 15, there will be read a paper on "Advantages and Disadvantages of Glasses in Railway Service." The Academy will be pleased to have railroad officers interested in this question attend the meeting and take part in the discussion of the paper. The Secretary is Dr. Geo. A. Suker, Columbus Memorial Building, Chicago.

Pressed Steel Elevator Buckets.

The Link-Belt Engineering Co., Philadelphia, is using pressed steel for its elevator buckets. The new buckets are made in one



Pressed Steel Conveyor Buckets.

piece free from seams and rough surfaces, and are from 20 to 40 per cent. lighter than malleable iron buckets of corresponding sizes. The accompanying illustration shows the uniformity of gage and the symmetrical design. The advantages claimed for the new pressed steel buckets over cast buckets are compactness and lightness, they obviate the destructive wear on chain and sprocket wheels and prolong the life of the elevator. Where cement, sand, grain, coal, gravel and materials of a like nature are to be handled, the use of these buckets should prove materially advantageous. Users of japanned or galvanized buckets will recognize the superior qualities of pressed steel in the service demanded by the conditions that exact special surfaces in conveying buckets.

A Summer Story About a Summer-and-Winter Girl.

The speech of General Superintendent M. S. Connors, at the opening of the Railway Y. M. C. A. at Middleport, Ohio, on the Kanawha & Michigan, in which he advised the men in the service to get married and secure a home of their own, may result in at least two hearts being bound in happy wedlock. The speech was published in *The Dispatch* and was read by a young widow in the far-away west, who wrote to Mr. Connors asking that he recommend one of his men as a husband. Her communication was published and the other day inquiry was made by letter for the young widow's address. Mr. Connors wrote to the station agent at the town which was given as the home of the would-be suitor and the reply received was a great surprise for it plainly showed that the station agent himself was the one who had been mortally wounded by Cupid's dart. He had used an assumed name. It is said that correspondence between the agent and the widow, who admits that she is young and beautiful, will be commenced in the near future.—*Columbus Dispatch*.

Appreciation.

The St. Paul Jobbers' and Manufacturers' Association has resolved that—

"Whereas, one of the greatest steps forward has been made by the reduction of grain rates which will be of incalculable benefit to all classes and interests, and

"Whereas, though it is easy to realize the benefits now that the

thing is done, it is difficult to grasp the breadth of the mind that foresaw the wisdom of these reductions and was the one to inaugurate them. . . . its members acknowledge the high-minded policy and foresight of Mr. James J. Hill"—and so on.

Street Railways in Manila.

A long step forward in the Americanizing of the Filipino was celebrated recently at the official opening of the Manila Street Railway. The plant of the Manila Electric Railway & Light Co. not only serves the purpose of supplying adequate transportation and lighting service to Manila, but it justifies the belief of its promoters that it was possible to educate the Filipino so that he could undertake skilled work as well as that of an ordinary laborer. Many Filipinos are now employed in the capacity of carpenters and machinists, as well as conductors and motormen on the cars. During the last two and one-half years some 1,500 to 2,000 of the "little brown men" have been occupied in erecting the power house and car barns and installing a complete electric system. Their wages ranged from 50 to 70 cents per day, varying according to their occupation. The Filipinos were well satisfied with this small sum, because it was almost twice as much as they were accustomed to receive under Spanish rule. The main trouble was to keep them at work steadily. With their increased wages they felt that two or three days of consecutive labor was quite sufficient. By allowing them to observe innumerable feast-days, and letting them take



The Street Railway System of Manila.

a rest in the middle of the day when the heat was intense, the foreman found that they were more willing to work.

A hard problem was to find a wood for ties and poles, and also for the car bodies, which would withstand the assault of the white ant and be practically weatherproof. As an experiment, three kinds of wood were used for ties; the native wood called molave, California redwood, and an Australian wood. Further experimenting has been done by treating the ties with preservatives such as creosote, jodelite, solignum and carbolineum. The rails were painted with asphaltum, and in low lying ground were laid in concrete. The only wood which seemed to be ant-proof was teak, and the cars were built of this material, combined with steel of a heavy design which was carefully protected with rust-proof paint. Teak is a dense hard wood which needs no chemical treatment. It is difficult to work with tools and to steam bend, and has such a beautiful appearance that the cars were finished in the natural color wherever possible. The climate in Manila is intensely hot, and hurricanes are a common occurrence. The majority of the equipment consists of open cars, but several convertible and semi-convertible cars are being used for experimental purposes. Absolute simplicity was the keynote of the designs for the cars, so that there would be no difficulty in keeping the cars clean. The heavy driving storms occur so frequently that extra precautions were taken to secure the comfort of the passengers. All cars are vestibuled and equipped with curtains of Pantasote mounted on extra heavy slats which will resist the strongest wind. The gutters, water ducts, and cables for curtains are made of non-rusting metals, and the dash boards of

extra heavy steel. There is a considerable overhang to the monitor roofs, and the ventilation is so arranged as to readily dispose of any water which may collect. The Manila Electric Railway repair shops are thoroughly equipped to design and build their own cars, and are conducting experiments with a view to using native woods. The present equipment consists of 95 passenger cars furnished with Westinghouse two-motor equipments throughout. On account of the lower price of teak wood in Europe most of the car bodies were purchased there, but the trucks were purchased in America. The power house contains four Westinghouse turbo generators which produce approximately 4,000 h.p. electricity for general power purposes, and lighting is furnished by the company as well as the power for the street railroad. The power house, car barns, and other buildings are built entirely of steel and concrete, all metal being painted to guard against deterioration. The plant, which was built and is being operated by the J. G. White & Co., New York, is fully up to the most advanced standard of American practice.

Advertisement of 18-Hour Train(?)

Members of the Indiana State Board of Tax Commissioners sat up in their chairs and gasped. Well they might do so, for their ears were hearing unstinted laudation for the Pennsylvania system from an officer of the New York Central system. This remarkable praise came at a hearing of the Tax Board in the matter of the proposed taxation of the two systems. The Pennsylvania's Western division of the Ft. Wayne route through Indiana last year was assessed \$15,000 more a mile than the Lake Shore & Michigan Southern's line through that state. Attorney S. O. Pickens, of Indianapolis, solicitor for the Pennsylvania, had argued a couple of days before this hearing against this assessment being repeated this year. Mr. Pickens said that, inasmuch as both were first class roads and carry first class traffic, and as both run through the same territory, it was only fair that the assessment should be the same for both lines. This aroused the Lake Shore solicitor, Attorney E. T. Glennon, of Chicago, to the heat of the debate, and he went into the matter without gloves. The praise of the Ft. Wayne route was unstinted, Mr. Glennon claiming that the difference in the assessment was justified by the difference in the roads.

"This division of the Pennsylvania is better than our road," Mr. Glennon is quoted as saying, while speaking of the Ft. Wayne route. "We admit the superiority of the Pennsylvania roadbed and the general excellence of their rolling stock. Their roadbed is rock; ours is gravel, and if there was any law in Indiana for taking real estate out of the state, the passengers on our trains would certainly be liable, because of the dust they accumulate."

"If the Pennsylvania has as good a roadbed clear through from Chicago to New York as it has on this Ft. Wayne division, the special train between these two cities could make the trip in 13 or 14 hours. We were forced to the 18-hour schedule, reducing our time to that after the Pennsylvania had cut an hour from our former 19-hour schedule. The Pennsylvania carries 70 per cent. of the total east-bound traffic from Chicago and far more west-bound traffic than the Lake Shore."—*Pittsburg Gazette*.

The Passengers Enjoy It.

The rapidity with which the Lackawanna has recovered from the recent Hoboken fire is little short of a miracle; for 130,000 persons and 3,000 teams pass through the Hoboken terminal every day of the year. First Vice-President E. E. Loomis was on the scene an hour after the blaze was discovered and took charge of operations. To him belongs chief credit for the excellent state of order that has been established. At daybreak the morning after the fire 1,500 men were busy clearing away the debris. . . . The temporary terminal is to-day nearly complete. The buildings are large and commodious one-story wooden structures, built in rough bungalow style, painted white inside and green without. They are already well equipped, and a large restaurant will soon be ready. One hundred thousand dollars has been spent in these temporary arrangements. The new steel station will be completed in about 18 months. General Passenger Agent Lee says the fire has hastened the erection of the station a full year. Mr. Lee was asked how his patrons stood the inconvenience of the temporary arrangement.

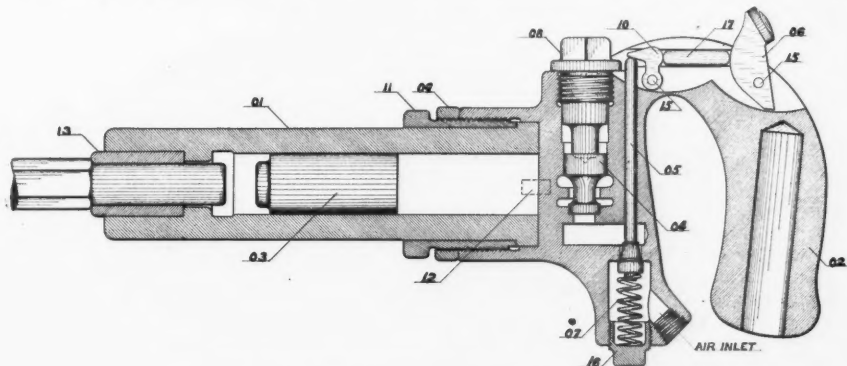
"Why," he replied, "the people seem to enjoy it. Every com-

muter comes through with a smile, for he sees something new every night." . . . Fires may come and sheds may go, but all trains run for Phoebe Snow.—*New York Globe*.

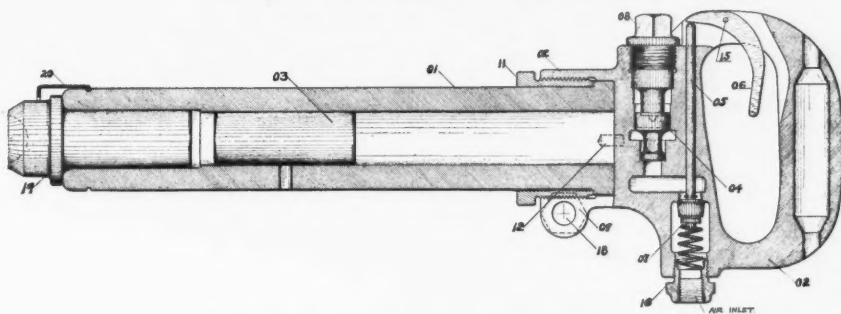
"Green" Pneumatic Hammers.

Sectional views of two classes of "Green" pneumatic hammers are shown in the accompanying engravings, one being the long-stroke riveting hammer, and the other a closed handle and pistol grip chipping and caulking hammer. Another class of the latter type, not shown, is similar in design to the long-stroke hammer. While a great many good points are claimed for these hammers, the first and most important relates to their simple construction, since they were designed with a view to minimizing the cost of maintenance and embodying such features of construction as will give them ample strength to withstand the severe service such tools must perform. The hammer consists of eight parts, namely, cylinder, handle, piston, main valve, valve plug, throttle valve, locking nut for coupling the cylinder and handle together, and trigger. Eight different size hammers are made which are all of the same general design, affording interchangeability of parts between the different size tools with the exception of the cylinders, which are of different lengths, and the handles, the latter being of a larger size on the long strokes than that used on the chipping and caulking hammers.

The valve mechanism, the life of a pneumatic hammer, is free from complication. The valve is a double piston, the simplest type obtainable. Live air is taken past its two ends and exhausted through the annular space between its two heads. It is perfectly balanced, is positive in action, and in addition to the laps provided, it is given a flat seat at each end of its stroke to eliminate leakage regardless of wear. A complicated valve lock is entirely



The Green Pistol Grip Chipping and Caulking Hammer.



The Green Long-Stroke Pneumatic Hammer.

dispensed with, the valve being placed vertically in the head block of the handle with the throttle valve directly behind it. This arrangement gives the most direct passage for air from hose to the hammer cylinder, and results in a higher cylinder pressure, producing a harder and quicker blow of the piston and also making it possible to operate the tool on an air pressure 25 to 50 per cent. lower than is customary in this practice. It is easily accessible and can be removed without disconnecting the handle from the cylinder. The best tool steel is used in its construction, which is hardened and ground to gage and is perfectly interchangeable.

The throttle valve is of the poppet type and is made of brass to prevent corroding and sticking. It is carefully balanced and graduated, giving thorough control of the hammer from the lightest to the heaviest blows. Only one longitudinal air port is used in the cylinders of the chipping hammers, and three in the cylinders of the long-stroke riveting hammers. It is stated that during a recent test with the 8-in. stroke hammer, $\frac{3}{4}$ in. structural rivets were driven in four and a quarter seconds. This is said to be the best time ever made on such work. The Dayton Pneumatic Tool Co., Dayton, Ohio, is the maker of these hammers.

The Manufacture of Claims.

Theodore Waters, in a lecture on "The Profession of Getting Hurt," before the Young Men's Club of the Church of the Archangel, tells about the fakirs who make a business of falling from street-cars and other public conveyances and gathering in money through lawsuits instituted against their owners. The lecturer produced a photograph of a prescription blank, such as are used in Bellevue Hospital, on which a physician had written the name of a lawyer on Broadway, with a view to having that lawyer handle the patient's case, which was one of accident. . . . It is a matter of fact that a runner for a lawyer is standing constantly in front of Gouverneur Hospital to pick off the accident cases that go to that institution. Some of the "ambulance chasers," on seeing a case on the way to a hospital, will fall in the street, "throw a fit," and be carried in the same ambulance to the hospital, there obtaining the other man's case for the "chaser's" lawyer. Mr. Waters said he spent several days in a hospital in Philadelphia, where he "fell" off a car to see how it worked. He was taken home, and was visited by innumerable lawyers, lawyers' clerks, cranks, agents, etc., and speedily recovered when the game "got warm." But, he said, it would have been easy to collect had he desired to do so.—*New York Tribune*.

Curtis Steam Turbines in Japan.

On July 29, 1904, the first shipment of steam turbines arrived in Japan via the steamship "Korea," from San Francisco. They were of 500 kw. capacity of the Curtis type, and were for operating the Shigai Railroad in Tokio. Four weeks after their arrival they were in full operation. As significant of the success of these first units, there have been ordered by the Japanese from the General Electric Company of New York, 37 Curtis steam turbines with electric generators with a total normal capacity of more than 35,000 h.p. Of these, 11 units are now installed and in satisfactory operation. Besides the adoption of electricity for tramway operation and for indoor and street lighting, Japan is following the best American practice in machine shops, which, as a rule, require electric motors mounted on each tool. The coal mines of Japan will also eventually be operated electrically. The Miike coal mines, on the Island of Kyushu, which are owned by Mitsui & Co., will use two 1,000 k.w. Curtis steam turbines.

The Osaka Electric Light Company, which furnishes electricity to the City of Osaka, which has a population of over 800,000, is equipped entirely with American electrical apparatus, including six steam turbines of the same make. The capital of this company is \$1,200,000, and with its progressive methods it will soon rival some of the modern American illuminating companies. One of the largest electrical interests in Japan, which has ordered some of the machinery referred to above, is the Tokio Street Railway Company, which furnishes transportation facilities for the city of Tokio with its population of 1,440,000.

Although some English and German material is being used by this road, practically all of the electrical equipment is American made. This includes five 2,000 h.p. Curtis turbo-generator units with power house equipment and railway motors furnished by the General Electric Company; Wheeler condensers and Brill trucks. Besides a small amount of German and English machinery,

such as boilers and trucks, there are a few small dynamos which were made in Japan.

Telephones on the Long Island Railroad.

The installation of a large number of telephones on the lines of the Long Island Railroad, in connection with the electrification of lines recently begun, has already been mentioned in the *Railroad Gazette*. The problems connected with electrification were quite intricate, and their solution demanded elaborate study. Each telephone affords direct communication with the Electrical Superintendent's office in Long Island City. Nearly 200 telephones are used, and they are scattered all along the line with not more than 2,000 ft. between them. One hundred of these telephones are placed in special boxes, similar to the boxes used by the Police and Fire Departments in New York and other cities. The employees of the repair and equipment departments are provided with keys, each one of which may be used for opening any or all of the boxes. There is a staff of electrical inspectors continually going over the line watching for possible trouble, and under the system adopted frequent reports to headquarters are made by these inspectors. To

facilitate prompt service in emergencies motor cars are provided for the quick transportation of emergency crews to the scene of any accident or reported trouble. Each of these gasoline motor cars, capable of making thirty miles an hour, and weighing but 750 lbs., is equipped with a portable telephone, provision being made for attaching them to telephone circuits at certain points. This system of inspection, supervision, motor-car emergency crews, and reporting by telephone, is undoubtedly as complete as any in the country. The telephone plant was supplied by the New York & New Jersey Telephone Co., and was put in under the supervision of Mr. L. S. Wells, the Electrical Superintendent of the railroad company.

Mail Discharging Device on the Rock Island.

The Chicago, Rock Island & Pacific has in use on one of its fast mail trains a device for discharging and receiving mail pouches that is said to be yielding most satisfactory results, performing satisfactorily at speeds from 15 to 70 m.p.h. According to information at hand, the device is entirely automatic and is operated by air from the brakes of the train. It consists of a platform arranged in the car door, on which the sacks of mail to be delivered are placed. Contact between the crane on the station platform and a trigger on the mail-catching arm on the car puts the mechanism in operation, which ejects the mail sacks into a receiving box placed at the side of the track, so constructed that the air is forced into either end by the momentum of the pouch and thus acts as a cushion, preventing damage to the pouch or its contents. The device combined with the standard crane, can be operated either to catch or deliver mail. Mail is being delivered daily from the Rock Island "Colorado Fast Mail" at a number of points in Iowa. The device is the invention of F. H. Burr, of Atlantic, Iowa, the patents being controlled by the Railway Mail Equipment Co., of that place.

London Tube Railways.

The chairman of the City & South London tube line stated on August 1st that the electric tramways of the London County Council had practically annihilated all its short distance traffic in South London. The hope of the company for the future lay in the direction of long distance fares and in that connection the extension of the tubes from Islington to Euston and St. Pancras will render great assistance. The extension is being proceeded with and the contract time expires in September, 1906. When completed the line will have connection with four steam railroads at that point; railroads whose suburban traffic is growing very fast. This traffic will be fed to the tube at Euston for conveyance to the city and South London districts. When the tube line has opened its various sections in the past it has tapped practically the full traffic at once, and there has been no continuous increase, because the districts affected have been already fully built upon and densely populated. By making connection with the Euston railroad systems, it is expected that this will be altered, as the new suburban traffic of the developing districts must continually be increasing. The City & South London early this year made considerable reductions in fares to see whether this would help the position, but it is reported that the result has been unsatisfactory.

The Baker Street and Waterloo tube system is nearing completion. The tunnels have been driven the whole way between Harewood avenue and Elephant and Castle, and between Harewood avenue and Westminster Bridge road and the depot. The permanent way will be completed early in September, the conductor rails in October, and the lift works by the end of November. The high tension cables are to be tested this month. The rolling stock has not been delivered yet, although it should have been in May. The motors, control equipments, etc., are all waiting. It was hoped that the line would be completed by the end of this year, but the large amount of detail work yet to be done renders this improbable. It is expected, however, that the full service of trains will be running between Westminster Bridge and Baker street early in 1906. The chairman of this company, Mr. T. J. Hare, at the half-yearly meeting on August 14 referred to the report of the Royal Commission on London Locomotion and said it seemed that it was most desirable to wait and see the full effect of the electrical working of the Metropolitan and District railways, and the several new tube lines now building and planned, and to observe the effect of the altered conditions brought about by motor traffic, before laying out capital upon unnecessary duplication of lines.

The Great Northern, Piccadilly & Brompton line, which is to be three-quarters of a mile long, double track, in separate tunnels, is being pushed forward by the contractors. All the tunnel work, with the exception of two small sections, has been driven and lined with cast-iron, between Holborn and Finsbury Park, and 97 per cent. of the concrete for the permanent way roadbed had been laid. For the Holborn-South Kensington section also the driving of the tunnels is almost completed. The progress of the Earls Court section is proceeding at about the same rate. It is expected that at the next half-yearly meeting the probable date of opening will be announced. The system is controlled by the Underground Electric Railways Co., of London, and electricity for operating the trains

will be supplied from the big generating station at Lot's Road, Chelsea.

The other tube line now being built is the Charing Cross, Euston & Hampstead, some $8\frac{1}{4}$ route miles long, between Charing Cross and Golder's Green and the Archway Tavern. This line also is to be under the control of the Underground Electric Railways Company of London.

The Great Northern & City during the first half of this year increased its earning per week from £1,404 to £1,778 (average), and its passengers carried from 201,062 to 445,830, exclusive of season tickets. In view of the unfortunate beginning which the line made, the improvement is regarded as very encouraging. The contractors (Messrs. Pearson), who still operate the line, receive 50 per cent. of the gross receipts. The ratio of working expenses to receipts has diminished each half year since the line was opened. A large amount of additional traffic could be handled without materially adding to the capital account. The passengers carried per car will have increased from 5.65 to 7.68. New rolling stock is on order to be ready to meet the heavy demands expected in the coming winter. The extension of the line from Moorgate street to Lothbury, in the heart of the city, will be undertaken as soon as the necessary capital can be raised.

The Waterloo & City Railway working expenses have been reduced from 47.55 per cent. in 1904 to 45.37 per cent. in 1905. It is still considered unprofitable to work the line on Sundays. The North East London Railway Bill, which has been occupying Parliamentary attention for some time, is still undergoing exhaustive examination. It is proposed to build an electric railway, partly in tube and partly in the open, from the city to Waltham Abbey. The estimated traffic from all sources has been put down at $44\frac{1}{2}$ millions per annum, but this estimate was cut up by representatives of the Great Eastern and other railroad companies. Sir Douglas Fox, the engineer-in-chief for the line, estimated the cost of the undertaking at about £2,600,000. A decision of the committee will be given shortly.

Manufacturing and Business.

Mr. F. B. Archibald, formerly in the Railway department of Berry Bros., Detroit, is now sales representative of the National Lock Washer Co., of Newark, N. J.

Mr. W. R. Strickland, formerly in the office of the Engineer of Maintenance of Way of the New York Central, is now Assistant to the Secretary of J. G. White & Co., New York City.

The Falls Hollow Staybolt Co., Cuyahoga Falls, Ohio, state that it has received orders for hollow staybolt iron bars from the Imperial Railway of North China and from a leading railroad of Japan.

Mr. R. W. Christian has, by contract with the Allis-Chalmers Company, given that company the exclusive right to his patents and also his services as engineer in designing and constructing gold dredges embodying his inventions.

The firm of J. G. White & Co. will be represented at the convention of the American Street Railway Association, to be held in Philadelphia, September 25-30, by Mr. W. E. Harrington, Mr. W. E. Goldsborough and Mr. William Petsell.

Mr. F. W. Williams, who recently resigned as Master Mechanic on the Delaware, Lackawanna & Western, is now Superintendent of the Leslie Co., of Lyndhurst, N. J., maker of the Leslie pressure regulator and other steam and hydraulic specialties.

Mr. Geo. M. Basford, editor of the *American Engineer & Railroad Journal*, is to take charge of the newly established Department of Publicity of the American Locomotive Co. He will take his new position on October 1, with office at 111 Broadway, New York City.

At a meeting of the board of directors of the Locomotive Appliance Co., Chicago, on August 21, the following officers were elected: Ira C. Hubbell, President; Willis C. Squire, Clarence H. Howard and J. J. McCarthy, Vice-Presidents; J. H. Allfree, Consulting Engineer; E. B. Lathrop, Treasurer; W. H. England, Secretary; Executive Committee, Ira C. Hubbell, Willis C. Squire and E. B. Lathrop.

The co-partnership existing under the firm name of Bates & Neilson has been dissolved by limitation. Putnam A. Bates has succeeded to the business of the above firm, and, as before, will devote his time to giving special attention to the preparation of plans, specifications and supervision of electrical installations, special investigations and reports, and the application of electric power to machinery.

The Fort Pitt Spring & Manufacturing Co. of Pittsburg announces the election of William McBride as President, F. W. Wallace as General Manager and Treasurer, and George W. Cox as General Sales Agent. Mr. McBride has been for several years connected with the Sales Department of the Standard Underground Cable Co., of Pittsburg. Mr. Wallace has had considerable practical experience in the manufacture of springs and under his supervision the company's plant, which is located at McKees Rocks, Pa., has been completely modernized and equipped with up-to-date machinery for the manufacture of coil springs of all kinds. Later on

it is planned to make elliptical springs also. Mr. Cox was for eight years connected with the St. Charles and Madison plants of the American Car & Foundry Co., and for two years with the Pressed Steel Car Co., and has a wide acquaintance in the railroad world.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies, see advertising page 24.)

American Society of Civil Engineers.

At the business meeting of this Society, September 6, a paper by Edwin H. Warner, M. Am. Soc. C. E., on "The Hydraulic Plant of the Puget Sound Power Company," was presented. This paper was printed in the *Proceedings* for May, 1905.

Iron and Steel Institute.

At the meeting to be held in Sheffield September 26, 27, 28 and 29, there will be papers on "The Wear of Steel Rails on Bridges" and on "The Transformation of Nickel Steels." The other papers to be read were mentioned in the preliminary program of the meeting which was given in the *Railroad Gazette* of August 11.

PERSONAL.

—Mr. Charles H. Hix, who was recently appointed General Superintendent of the Seaboard Air Line, was born in Nelson County, Va., in 1862. He entered railroad service in 1880 as rodman in an engineering corps on construction work on the Norfolk & Western. In the winter of 1881 he was appointed receiving and delivery clerk at Saltville, and at the end of the year was made assistant agent and operator at that point, being appointed in 1884 agent at Buford, Va. In 1886 he was appointed relief agent, and in 1888 train despatcher at Roanoke. He held this position until Oct. 1, 1891, when he was appointed chief despatcher. He was appointed trainmaster of the Radford division in 1897. Owing to a change in administration, he was appointed chief despatcher again, remaining there until July 1, 1900, when he went to the Seaboard Air Line as trainmaster of the Second division. He was appointed trainmaster of the First division on June 1, 1901, and Superintendent of the First division in September of the same year. He has held this position until the first of the present month, when he was appointed General Superintendent.



Charles H. Hix.

—Mr. L. J. Ferritor, who was recently appointed Superintendent of the Middle division of the Wabash, was born in Athens, Ohio. He began railroad work at the age of 15 as telegraph operator on the St. Louis, Kansas City & Northern, having studied telegraphy while at school. Later he was made traveling agent and operator, and in 1880 was appointed train despatcher on the Omaha division. In 1885 he was appointed chief despatcher of that division, where he remained until 1896, when he went to the Grand Trunk as trainmaster at Stratford, Ont. Eighteen months later he was made Assistant Superintendent at London, Ont., and was later appointed joint Superintendent of the Wabash and the Grand Trunk at St. Thomas, Ont. In February, 1904, he was made Superintendent of the Eastern division of the Wabash, where he remained until appointed Superintendent of the Middle division.



L. J. Ferritor.

—Mr. M. J. Caples, who was recently appointed General Manager of the South & Western, entered railroad service in 1883 in

the engineering department of the Boston & Lowell. He remained with that company until August, 1887, serving successively as rodman, transit man and division engineer on construction. From 1887 to November, 1889, he was in South America engaged in mining work and railroad surveys for the Republic of Columbia. At the end of that time, he was appointed Resident Engineer on construction of the Norfolk & Western, being later promoted to be Supervisor. In 1893, he was made Assistant Division Engineer, but in August, 1899, left railroad service to go into lumber manufacturing business in West Virginia. In August, 1901, he was appointed Engineer of Maintenance of Way and Trainmaster of the Columbus, Sandusky & Hocking. He returned to the Norfolk & Western in April, 1902, as Superintendent. Later he was made General Manager of the Pocahontas Coal & Coke Co., a subsidiary company of the railroad, and in January, 1904, Superintendent of the Pocahontas division, which position he has left to accept his present appointment.

ELECTIONS AND APPOINTMENTS.

Canadian Northern.—C. W. Spencer, until recently General Superintendent of Transportation on the eastern lines of the Canadian Pacific, has been appointed General Manager of the Canadian Northern lines east of Fort William.

Canadian Pacific.—W. R. Baker, Assistant to the Vice-President, has been appointed Assistant to the President.
See also *Canadian Northern*.

Cleveland, Cincinnati, Chicago & St. Louis.—S. D. McLeish has been appointed Assistant General Passenger Agent, with headquarters at Indianapolis, succeeding H. M. Bronson, who has been in the service over 50 years and who, at his own request, is to be transferred.

El Paso & Southwestern.—F. L. Hunter, Superintendent of the Western division, has been appointed General Purchasing Agent.

Grand Trunk Pacific.—Archibald Glassco has been appointed Bridge Engineer, with headquarters at Montreal.

Missouri Pacific.—A. R. Duncan has been appointed Car Accountant of this road and of the St. Louis, Iron Mountain & Southern.

C. O. Eames has been appointed Chief Special Agent, with headquarters at St. Louis. Heads of departments are to refer all matters relating to special service direct to him.

Northern Alabama.—See *Southern*.

Northern Pacific.—William Richards, Assistant Auditor of Freight Receipts, has been appointed Auditor of Freight Receipts, succeeding E. H. C. Taylor, deceased; and the office of Assistant Auditor of Freight Receipts has been abolished.

Seaboard Air Line.—W. R. Hudson, Superintendent of the Second division, has been appointed Superintendent of the First division, succeeding C. H. Hix, promoted. W. J. Jenks, Superintendent of the Fourth division, succeeds Mr. Hudson, with headquarters at Raleigh, N. C. Walter Hale, Superintendent of the Fifth division, succeeds Mr. Jenks, with headquarters at Jacksonville, Fla.

Southern.—George G. Thompson, Jr., Assistant General Freight Agent of this road and of the Northern Alabama, has been appointed Division Freight Agent, with office at Greensburg, N. C. E. H. Shaw succeeds Mr. Thompson, with headquarters at Birmingham, Ala.

Southern Indiana.—F. W. Ranno, Engineer of Way and Structures, has resigned. E. H. Pfafflin succeeds Mr. Ranno, with office at Chicago.

Western Pacific.—Thomas J. Wyche, Resident Engineer of the Union Pacific at Omaha, Neb., has been appointed Supervising Engineer in charge of the construction of the first 282 miles of the W. P. out of Salt Lake.

LOCOMOTIVE BUILDING.

The *Midland Valley* has ordered four locomotives from the Baldwin Locomotive Works.

The *Western Maryland* has ordered two locomotives from the Baldwin Locomotive Works.

The *Hocking Valley* has ordered nine locomotives from the American Locomotive Works.

The *Illinois Northern* has ordered two four-wheel saddle tank locomotives from the Baldwin Locomotive Works.

The *New York, New Haven & Hartford* denies having ordered 17 locomotives, as reported in our issue of August 25.

The *Intercolonial* has been authorized by the Dominion Government to purchase 40 locomotives from Canadian firms.

The Delaware, Lackawanna & Western has ordered five passenger locomotives from the American Locomotive Company.

The Cuba Company has ordered six 10-wheel locomotives from the American Locomotive Co. These are for freight and passenger service and are for this year's delivery.

The Lehigh Valley has ordered 10 simple (4-6-0) freight locomotives from the Schenectady Works of the American Locomotive Co. These locomotives will weigh 199,200 lbs., with 150,200 lbs. on drivers. Total weight of engine and tender, 351,100 lbs.; cylinders, 21 in. x 28 in.; diameter of truck wheels, 33 in.; straight boiler, with a working steam pressure of 205 lbs.; heating surface, 3,084.26 sq. ft.; firebox, 199.98 sq. ft.; total, 3,284.24 sq. ft.; 378 charcoal iron tubes 2 in. in diameter and 15 ft. 8 in. long; wide firebox, 120½ in. x 102 in.; grate area, 85.08 sq. ft.; tank capacity, 7,500 gallons; and coal capacity, 12 tons. The special equipment includes: Westinghouse air-brakes, Richardson's balanced valves and Paige engine, truck and tender wheels.

CAR BUILDING.

The Elgin & Belvedere Electric is in the market for eight cars.

The Boston & Maine has ordered seven passenger cars from the Laconia Car Co.

The Pennsylvania Lines have placed a large order for cars with the Pressed Steel Car Co.

The Chicago, St. Paul, Minneapolis & Omaha has ordered 500 cars from the Pullman Co.

The Nashville, Chattanooga & St. Louis, it is reported, will build 100 box cars at its own shops.

The Kansas City Southern has ordered 1,000 box cars from the American Car & Foundry Company.

The Merchants Despatch Transportation Co. will build 250 refrigerator cars at its Despatch shops.

The California & Northwestern has ordered 10 freight cars from the Russell Wheel & Foundry Company.

The New York, New Haven & Hartford, it is reported, has ordered 200 box cars from the Keith Manufacturing Co.

The Kansas City Southern is figuring on five chair, two combination passenger and mail, and one combination mail and express car.

The Southern has ordered 20 passenger cars from the American Car & Foundry Co., five from the Pullman Co. and four from the St. Louis Car Co.

The Charleston (S. C.) Mining & Manufacturing Company has ordered through The Cameron & Barkly Co., Charleston, S. C., 30 flat cars from the South Atlantic Car & Manufacturing Co.

The Wabash.—It has been persistently reported that this road will place a large order for freight equipment in the near future. An official of the road writes that it is not preparing specifications for freight equipment with a view of going into the market in the near future, and that it will probably be some months before the purchase of additional equipment is even considered.

The Green Bay Traction Company, of Green Bay, Wis., as reported in our issue of August 25, has ordered two interurban cars from the St. Louis Car Co. for September delivery. These cars have wood bodies and combination wood and steel underframes. The length inside will be 34 ft., and the over-all dimensions will be 48 ft. 2 in. long x 8 ft. 8 in. wide. The cars were ordered through the Knox Engineering Co., Managers and Purchasing Agents, Chicago.

The Kankakee Electric Railway Co., Kankakee, Ill., has ordered 32 single truck passenger cars from the St. Louis Car Co., for October delivery. These cars will weigh 15,000 lbs., and measure 21 ft. long, 8 ft. 2½ in. wide and 9 ft. 3 in. high, all inside measurements. The special equipment will include: St. Louis Car Co.'s axles, bolsters, brake-beams, brake-shoes, air-brakes, brasses, couplers, curtain fixtures, curtain material, door fastenings, doors, draft rigging and seats.

The Colorado & Southern, as reported in our issue of August 11, has ordered 200 Ingoldsby dump cars of 80,000 lbs. capacity from the Pullman Co., for December delivery. The special equipment will include: Block-Pollak Iron Co.'s axles, Commonwealth Steel Co.'s bolsters, Pullman brake-beams, brake-shoes and dust guards, Westinghouse air-brakes, Hewitt Manufacturing Co.'s brasses, R. E. Janney couplers, Miner draft rigging for 190 cars, and Commonwealth Steel Co.'s draft rigging for 10 cars, Symington steel journal boxes, Lowe Bros. paint, Railway Steel Spring Co.'s springs, Diamond frame arch-bar trucks and Griffin Wheel Co.'s wheels.

The Orange & Northwestern has ordered 50 standard logging cars, as reported in our issue of August 25, of 60,000 lbs. capacity from the Beaumont Iron Works, Inc., of Beaumont, Tex., for Oct. 3, 1905, delivery. These cars are to weigh 19,000 lbs., and will measure 3 ft. high inside, and 34 ft. long, 9 ft. wide and 3 ft. 6 in. high over all, with wood and metal frames and underframes. The

special equipment will include: Beaumont Iron Works' axles, bolsters, brake-beams, brake-shoes, brasses, draft rigging, journal boxes and trucks; Westinghouse brakes, Tower automatic couplers, Railway Steel Spring Co.'s springs, and American Car & Foundry Co.'s wheels.

The Mexican Central has ordered from the American Car & Foundry Co. 40 steel tank cars with wooden underframes for carrying fuel oil. These cars have a capacity of 9,800 gallons each and measure 36 ft. over end sills x 6 ft. 8 in. over side sills. The height from rail to top of man hole is 12 ft. 1¼ in. The smallest outside diameter of tank is 7 ft. 2½ in., and the length over ends is 33 ft. 2 in. The special equipment includes: Wrought iron axles and bolsters, National-Hollow brake-beams, Christie brake-shoes, Westinghouse air-brakes, Tower couplers, Westinghouse friction draft rigging, Soule dust guards, McCord journal boxes and Mexican Central 80,000 lbs. standard car trucks.

The Central of Georgia, as reported in our issue of September 1, has ordered 50 Hart convertible ballast cars of 80,000 lbs. capacity from the Rodger Ballast Car Co. for delivery within 30 or 40 days. These cars will weigh 35,600 lbs. and will be 32 ft. 2 in. long, 8 ft. 8 in. wide, and 3 ft. 4¼ in. high, inside measurements, and 34 ft. long and 9 ft. wide over sills; extreme width, 10 ft. 3 in., with wooden frames and underframes. The special equipment will include: M. C. B. steel axles, Common Sense bolsters, Sterlingworth brake-beams, M. C. B. brake-shoes with Christie heads, Westinghouse brakes, M. C. B. brasses, Tower couplers, Rodger Ballast Car Co.'s door fastenings, side and center drop doors, Miner tandem draft rigging, M. C. B. malleable journal boxes, Carbon black paint, Railway Steel Spring Co.'s springs, arch-bar trucks and American Car & Foundry Co.'s wheels.

The Mexican Central has ordered 20 passenger coaches from Barney & Smith. Five of these are first class, five second class and 10 are third class. The second and third class are identical in every respect except the height of the back of the seats. The first class coaches weigh 38,000 kgs. empty, and measure 59 ft. 1 in. over end sills x 9 ft. wide; height from top of sill to bottom plate, 6 ft. 8 in. Both bodies and underframes are of wood. The second and third class coaches weigh 31,800 kgs., and measure 60 ft. over end sills x 10 ft. over eaves. The underframes and sides are of wood. The special equipment for all includes: Wrought iron axles and bolsters, National-Hollow brake-beams, Christie brake-shoes, Westinghouse air-brakes and automatic slack adjusters, M. C. B. standard brasses, National Miller combination couplers, Forsyth curtain fixtures, Pantasote curtain material, Westinghouse friction draft rigging, Soule dust guards, Baker heating system, McCord journal boxes, Pintsch gas, Standard Steel Car Co.'s platforms, Pullman vestibules and Chicago Railway Equipment Co.'s automatic frictionless side-bearings. The first class coaches are mounted on Mexican Central standard six-wheel trucks, and the second and third class coaches are four-wheel trucks with journals 4¼ in. x 8 in.

BRIDGE BUILDING.

CHILLICOTHE, OHIO.—Bids are wanted September 11 by C. H. Pinto, County Auditor, for building the superstructures of two steel bridges.

INDIANAPOLIS, IND.—The County Commissioners' budget for 1906 submitted to the County Council, asks for an appropriation of \$190,000 for a new White river bridge at Thirtieth street.

JEFFERSON CITY, Mo.—Bids are wanted October 1 by James H. Jones, Russellville, Mo., for building a steel bridge over Coon creek, in Cole county. F. W. Roer is County Clerk.

MOSCOW, IDAHO.—Bids are wanted September 11 for building three bridges over Paradise creek.

PORT HURON, MICH.—The Common Council is arranging to at once build a new bridge over the Black river at Military street to cost about \$65,000. W. W. Phillips is City Engineer.

PORT ORCHARD, WASH.—Bids are wanted October 2 by the County Commissioners for building a 480-ft. bridge with a lift draw. R. S. Haywood is County Auditor.

RIPON, CAL.—A contract has been given by the County Board of Supervisors to the Pacific Construction Co. for the substructure and superstructure of a concrete bridge to consist of two spans each 100 ft. long to be built over the Stanislaus river at a cost of \$26,500.

SEGUIN, TEX.—Bonds amounting to \$20,000 are to be issued to raise funds to build a bridge over the Guadalupe river near this place.

UTICA, N. Y.—According to press reports of Sept. 5, the recent heavy rainfall and high waters have carried away about 150 highway bridges in central New York. The loss is so extensive that state aid will probably be asked to replace the bridges lost. Some of these were large structures. The line of the Unadilla Valley Railroad from Bridgewater to New Berlin had very serious washouts.

WASHINGTON, D. C.—Bids are wanted September 25 by Lieut.-Col. R. L. Hoxie, U. S. Engineers, for building a concrete steel bridge over Washington channel in the approach to the highway bridge over the Potomac river.

Other Structures.

ASH PARK, WIS.—The Atchison, Topeka & Santa Fe will put up a new station here to cost about \$75,000.

BURNSIDE, ILL.—The Illinois Central, according to reports from Chicago, is planning to make improvements at its shops by putting up a new brick boiler house 550 x 120 ft., a car shop 160 x 362 ft. and a 30-stall roundhouse, at a cost of \$300,000.

DAYTON, OHIO.—The Cincinnati, Hamilton & Dayton will let a contract on September 21 for putting up a brick freight house three stories high, to cost about \$150,000.

DENNISON, OHIO.—The Pennsylvania has bought 20 acres of ground as a site for new shops, a large roundhouse and a yard.

EL PASO, TEX.—The El Paso & Southwestern will put up a new roundhouse here, to cost about \$30,000.

GUELPH, ONT.—The Guelph & Goderich has plans ready for putting up 12 stations along the line of its road at a total cost of \$150,000.

HARRISBURG, PA.—The Central Pennsylvania Traction Co., which operates all the electric lines in Harrisburg, has authorized the construction of a new power plant to cost between \$200,000 and \$250,000.

LEE'S SUMMIT, MO.—The Missouri Pacific has plans ready for putting up a brick passenger station 24 ft. x 145 ft.

MALONE, N. Y.—Arrangements are being made by the New York Central to enlarge its car shops at this place at a cost of about \$170,000.

MT. CARBON, PA.—Plans are being made by the Pennsylvania to build a new boiler house and power plant, to contain an electric lighting generator and an air compressor.

NIAGARA FALLS, N. Y.—The New York Central, it is said, has been granted a building permit to put up a new roundhouse here to cost \$175,000.

PORTSMOUTH, VA.—The Seaboard Air Line will put up a boiler shop 60 x 280 ft.

SIoux CITY, IOWA.—Negotiations are under way by the Great Northern to buy 82 acres of land as a site for new shops and a roundhouse, to cost about \$250,000.

VALLEY JUNCTION, IOWA.—The Chicago, Rock Island & Pacific is putting up a new 50-stall roundhouse to cost about \$90,000.

WASHINGTON, PA.—The Pennsylvania has plans ready for replacing the present passenger station with a brick structure.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

CAIRO & TENNESSEE.—This road, which was incorporated in Tennessee to build from Bristol, in that state, to a point in Whitley County, Ky., a distance of about 400 miles, proposes to begin grading within the next two months between Wyckliff and Bristol. The route will be from Wyckliff via Mayfield, Cadiz, Hopkinsville, Franklin, Thompkinsville and Pineknott to Jellico, Ky., cross the Louisville & Nashville at Franklin and the Cincinnati, New Orleans & Texas Pacific at or near Pineknott. The office of the company is at 111 Broadway, New York. Charles H. Delano is General Manager at Wyckliff, Ky.; B. A. Neale is Vice-President; H. C. Neale, Second Vice-President; E. S. Beaumont, Secretary, and R. E. Lochbridge, Treasurer. (July 28, p. 30.)

CENTRAL OF GEORGIA.—The Greenfield branch of this company, running from Columbus, Ga., northeast to Greenfield, 49.6 miles, which has at present a 3-ft. gage, is to be made standard gage, and on the completion of this work the road will be extended north to Newnan, a distance of 20 miles, where connection will be made with the Atlanta & West Point, giving a route from Columbus to Atlanta shorter than any other line.

CHICAGO & ALTON.—Announcement has been made that the Patton & Gibson Construction Co., of Pittsburg, has a contract at \$750,000 for straightening, leveling and double tracking a portion of this road between Chicago and Kansas City, and between Bloomington, Ill., and St. Louis.

COLUMBUS & LAKE MICHIGAN.—This company, which operates a road from Defiance, Ohio, south to Lima, a distance of 42 miles, will build an extension from the latter place southeast to Columbus, about 80 miles, for which the right of way has been secured.

DENVER & RIO GRANDE.—Surveys are being made by this company to build a line from Fort Garland, Colo., through San Luis, Costilla and Rinconada, passing within eight miles of Taos, down Red river and Rio Grande canyons to Embudo, in Rio Arriba

County, a distance of about 95 miles. This cut-off will greatly reduce the grades and it will have a large traffic in ore and agricultural products.

DES MOINES, IOWA FALLS & NORTHERN.—The location survey for the extension of this company's road from Iowa Falls to Mason City has been completed. The proposed line runs in a northerly direction from Iowa Falls to Hampton, the county seat of Franklin County, thence west a short distance to a section line and thence due north in a straight line for 28 miles to Mason City. Agents of the company are now in the field securing the right of way. Contracts for grading the extension will soon be let. (See Construction Record.)

EDMONDS & EASTERN.—An officer writes that this company will at once let contracts for building 36 miles of its proposed road. The work, which is not difficult, includes the building of one steel bridge. (August 25, p. 62.)

FLORIDA EAST COAST.—An officer writes that bids are to be opened September 9 by J. R. Parrott, Vice-President and General Manager, at St. Augustine, Fla., for concrete work on the proposed Key West extension of this road. (See Construction Record.)

GREAT NORTHERN.—Surveys are being made by this company for a line from near Devil's Lake, N. Dak., northward to Brandon, Man.

ILLINOIS CENTRAL.—Rights of way have already been obtained by this company through Winston and Marion Counties, Ala., and others are being secured in Walker County, for the proposed branch line from Jackson, Tenn., to Birmingham. Preliminary surveys were made some time ago and active work is to be begun during the present year. (April 28, p. 143.)

This company is building a branch line from Philipp City, in Tallahatchie County, Miss., on the Yazoo & Mississippi Valley, north following the Tallahatchie river to the Panola County line, thence east to the main line of the Illinois Central at or near Sardis, a distance of about 60 miles.

KANAWHA & WEST VIRGINIA.—Bids are wanted September 9 by N. C. Van Natta, Chief Engineer, Charleston, W. Va., for the grading, masonry, trestle work and track laying on the proposed extension of this road, which will be 13½ miles long.

MEXICO CITY ROADS.—A syndicate of American and Mexican capitalists, in which Col. Felix Diaz and S. S. Neff, formerly General Superintendent of the Street Railway System in Mexico City, are interested, has made application to the Federal Government for a concession to build a system of elevated and subway railroads in that city. The cost of the proposed work will be about \$5,000,000.

MICHIGAN CENTRAL.—In order to have its tracks permanently settled by the time the tunnel under the river is completed, this company has notified the Common Council of Detroit, Mich., that it will separate all grade crossings between Livernois avenue and Fifteenth street in addition to its general agreement with that city to spend \$200,000 a year for grade separation work. The total cost to the Michigan Central for the work will be about \$1,200,000.

NASHVILLE INTERURBAN.—This company has recently secured the rights and franchises of the Nashville & Columbia Electric Railway and the Nashville & Gallatin, and will at once begin the construction of its line from Nashville south to Franklin, Tenn., a distance of 21 miles. C. S. Brown is Consulting Engineer.

OREGON EASTERN.—Incorporation has been granted a company under this name in Oregon with a capital of \$1,000,000 to build a railroad from Natron, Ore., the present terminus of the Springfield branch of the Southern Pacific, east to Ontario, Ore., on the Oregon Short Line, a distance of about 320 miles. The incorporators are connected with the Harriman Lines.

PHILADELPHIA RAPID TRANSIT.—A contract has been given by this company to the E. E. Smith Contracting Co. to build the Market street subway around the City Hall from Fifteenth street eastward to Juniper street. The cost of the work will be about \$3,000,000.

PINEVILLE & NORTHERN.—This company has been incorporated in Missouri with a capital of \$50,000 to build a railroad from Pineville, in McDonald County, Mo., northeast about 40 miles to Monett, where connection will be made with the St. Louis & San Francisco. The stockholders include: John A. Sturges, Adair W. Noel, E. E. Coffee and others, of Pineville. The office of the company will be at Pineville.

ST. LOUIS, VANDALIA, TERRE HAUTE & EASTERN TRACTION.—Articles of incorporation have been filed in Illinois by a company under this name with a capital of \$1,000,000, to build a railroad, with branches, from East St. Louis, Ill., northeast to Terre Haute, Ind., a distance of about 550 miles. The directors include: Peter Chase, Decatur, Ill.; Charles W. Mills, Chicago; Louis H. Bissell, Effingham, Ill.; H. J. Wanner and W. D. Baldwin, Chicago. The office of the company will be in East St. Louis.

SAN PEDRO, LOS ANGELES & SALT LAKE.—This company is planning to build a spur from a point on its road near Las Vegas, Nev., east to the Grand Canyon of the Colorado in Arizona, a distance of about 26 miles.

SOUTHERN.—Rights of way have been secured by this company for building a branch from French Lick Springs, in Orange County, Ind., on the Chicago, Indianapolis & Louisville, southwest to Jasper, in Dubois County, a distance of about 20 miles. The work includes the piercing of a tunnel 2,000 ft. long, for which a contract has been let to a contractor of Knoxville, Tenn. It is expected to have the line in operation by Oct. 1, 1906.

SPRINGFIELD SOUTHWESTERN (MISSOURI PACIFIC).—A contract has been given by this company to the Willard Construction Co., of Springfield, Mo., to grade 32 miles of its new road from Springfield, on the St. Louis, Iron Mountain & Southern, southwest to Crane. The contract calls for the completion of the work about April 1, 1906. (March 24, p. 90.)

STANDARD COAL & RAILROAD COMPANY.—This company, which was recently formed with a capital of \$2,000,000, is making surveys for building a line from Truro, N. S., west to Parrsboro, and thence north to Maccan, a total distance of about 80 miles.

STILLMORE AIR LINE.—This company, which operates a road from Wadley, Ga., southwest to Collins, a distance of 54 miles, is planning to build an extension from its northern terminus via Warrenton to Comak, about 40 miles, where traffic arrangements are to be made with the Georgia road. It is intended to ultimately extend the road from Comak north to Elberon, a distance of 50 miles, where connection will be made with the Seaboard Air Line.

TEXAS ROADS.—Rights of way have been secured by Orton G. Campbell, of Dallas, Tex., for building a railroad from Lometa, Texas, west to San Saba, a distance of 22 miles.

TRINITY & BRAZOS VALLEY.—An officer writes that this road is to be extended south from Mexia to Houston, Tex., and from Dallas to a point near Mexia, a total distance of about 230 miles. A contract for the construction work has been let to P. M. Johnston & Co. and grading has already begun at three or four places. The lines lie through a rolling prairie country. Maximum grade will be .5 per cent.; maximum curve will be 4 degrees. The work includes the building of three steel bridges of about 60 ft. each.

UNION (PITTSBURG).—Plans for building the Carnegie Steel Co.'s portion of the railroad to connect the Union Railroad with the West Side Belt (Wabash) have been completed and contracts will shortly be let. The work is to be finished within six months. According to an arrangement between the Carnegie company and the Wabash, each company will build a part of the connecting link. The proposed road extends from Longview, Pa., on the West Side Belt, to Duquesne, a distance of 10 miles, where connection will be made with the Union Railroad. The work will be rather expensive, as it is intended to build a first class railroad. The contract for the four miles to be built by the Wabash, beginning at Longview, has been let to the Moran-Phellen Construction Co., of Pittsburg. Grading has been started and it is expected that this portion of the work will be completed by January 1.

VIRGINIA & SOUTHWESTERN.—This company, it is said, is ready to begin the building of its proposed new line from Clinchport, Va., northeast to Tom's Creek, a distance of about 28 miles.

WASHINGTON, BALTIMORE & ANNAPOLIS (ELECTRIC).—This company, which has an ordinance pending before the Baltimore City Council for permission to operate its suburban cars in the city, has organized a subsidiary company to be known as the Baltimore Terminal Co. to build a terminal in Baltimore. President George T. Bishop, of Cleveland, is reported as saying that the new company has \$5,000,000, which will be spent in making these improvements. The company expects to operate high-speed electric cars between Baltimore and Washington, 31 miles, with a branch of 14½ miles.

WEST VIRGINIA MIDLAND.—A charter has been granted a company under this name in West Virginia, with a capital of \$500,000, to build a railroad from Sutton, on the Baltimore & Ohio, southeast via Webster Springs to Marlinton, a distance of about 50 miles. The incorporators include: Col. John T. McGraw, of Grafton; former Congressman C. P. Dorr and J. E. Woddell, of Webster Springs; G. A. Heckner, of Palmer, and C. D. Elliott, of Parkersburg.

RAILROAD CORPORATION NEWS.

ARKANSAS SOUTHERN.—See Chicago, Rock Island & Pacific below.

BUFFALO, HAMBURG & AURORA.—The receiver of this road is distributing \$76,000 among the creditors of the line, making the final dividend. The road is now operated as the Buffalo Southern.

CHICAGO & ALTON.—This company has absorbed the Quincy, Carrollton & St. Louis, which runs from Eldred, Ill., to Litchfield, 57 miles.

CHICAGO, ROCK ISLAND & PACIFIC.—At a meeting of the stockholders of the Arkansas Southern on August 25, negotiations were completed for the formal transfer of the road to the Chicago, Rock Island & Pacific. The Arkansas Southern runs from Eldorado, Ark., to Winnfield, La., 99 miles.

CONSOLIDATED RAILWAY (N. Y., N. H. & H.).—This company has paid a dividend of 2 per cent. on its \$10,000,000 capital. This is the first dividend declared by this company.

HAMPSHIRE & WORCESTER STREET.—This electric road, which extends from West Brookfield, Mass., to Ware, will be sold on September 16 under an order of the court. The American Loan & Trust Co., of Boston, is trustee.

INDIANAPOLIS, SHELBYVILLE & SOUTHWESTERN TRACTION.—This company has filed a mortgage for \$1,000,000 in Ripley County, Ind., on the roads now in operation between Indianapolis and Shelbyville, 26 miles; the franchise from Shelbyville to Greensburg, 20 miles; and the proposed extension from Greensburg to Batesville, 15 miles.

KANSAS CITY, MEXICO & ORIENT.—The International Construction Co., which is building the Mexican section of this road, is reported to have issued \$500,000 of two-year notes bearing 6½ per cent. interest, secured by \$1,000,000 of the bonds of the Kansas City, Mexico & Orient and also by the company's claim on the Mexican Government for subsidies amounting to \$950,000, gold. The Union Construction Co., which is building the line from Fairview, Kan., to Sweetwater, Tex., has issued \$275,000 two-year notes bearing 6½ per cent. interest secured by \$550,000 4 per cent. first-mortgage bonds of the Kansas City, Mexico & Orient and by the assignment of subsidies due from counties in Kansas and Oklahoma.

LEHIGH VALLEY.—The Common Pleas Court of Pennsylvania has decided that the 10 per cent. preferred stock of this company is cumulative and that therefore the company must pay back dividends from October, 1893. As dividends to the amount of 30 per cent. have already been paid to the stockholders, the amount due is now 70 per cent., or about \$95,000. The claim of the holders was that when this preferred stock was issued it took the place of the 10 per cent. preferred stock of the Beaver Creek Railroad, the terms of which were that no dividend should be paid upon common stock until dividends had been paid on the preferred stock for each year. The case will be appealed. (July 22, 1904, p. 42.)

MEXICAN CENTRAL.—The Mexican National Construction Co., which was recently bought by this road, has declared a dividend of 4.9 per cent. on the preferred stock. The Mexican Central has decided to pay over the entire amount of the current assets of the construction company to the old stockholders, and therefore an addition to this dividend of 9.3 per cent. will be paid on the preferred stock, making the entire dividend \$14.65 per share. (August 25, p. 64.)

NEWBURGH, DUTCHESS & CONNECTICUT.—The lease of this road to the New York, New Haven & Hartford has been canceled by the Central New England Railroad Co., which has resumed the operation of the road; and also of its own line from the Poughkeepsie bridge to Campbell Hall, N. Y. (July 21, p. 24.)

NEW YORK CENTRAL & HUDSON RIVER.—It is reported that of \$6,000,000 to be spent on the new 42d street terminal in New York, the New York Central will pay \$3,000,000 and the Lake Shore & Michigan Southern and the New York, Chicago & St. Louis the remaining \$3,000,000, being assisted, however, to a small extent, by the Western Transit Company, the New York Central's steamship line.

QUINCY, CARROLLTON & ST. LOUIS.—See Chicago & Alton above.

ST. LOUIS TRANSIT.—The Cella Commission Co., of St. Louis, is offering at 97½, and interest, \$1,000,000 5 per cent. 20-year gold bonds of this company.

SOUTHERN PACIFIC.—At a meeting of the shareholders on August 29, it was voted to increase the capital stock to \$160,000,000 and to issue a first refunding mortgage for \$160,000,000. (July 14, p. 16.)

STAMFORD (CONN.) RAILWAY (ELECTRIC).—A meeting of the shareholders has been called for September 12 to act upon a proposition to lease the road to the Consolidated Railway for a period of 999 years.

VIRGINIA & CAROLINA COAST.—This railroad company, which has been formed by a syndicate headed by Rudolph Kleybolte & Co., of New York, to develop a large timber tract in the North Carolina pine belt, has purchased the Suffolk & Carolina at a price said to be \$1,500,000. The Suffolk & Carolina runs from Suffolk, Va., to Edenton, N. C., and has 75 miles of track. It is reported that the Pamlico, Orient & Western, now under construction from Newbern, N. C., to Goose Creek, at the mouth of the Pamlico river, 37½ miles, has been also bought by the Virginia & Carolina Coast.

